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PC WORLD

October 1985 $2.95
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The Comprehensive Guide to
IBM Personal Computers and Compatibles

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Make Your PC Perform Like an AT

1-2-3 Templates for Your Business

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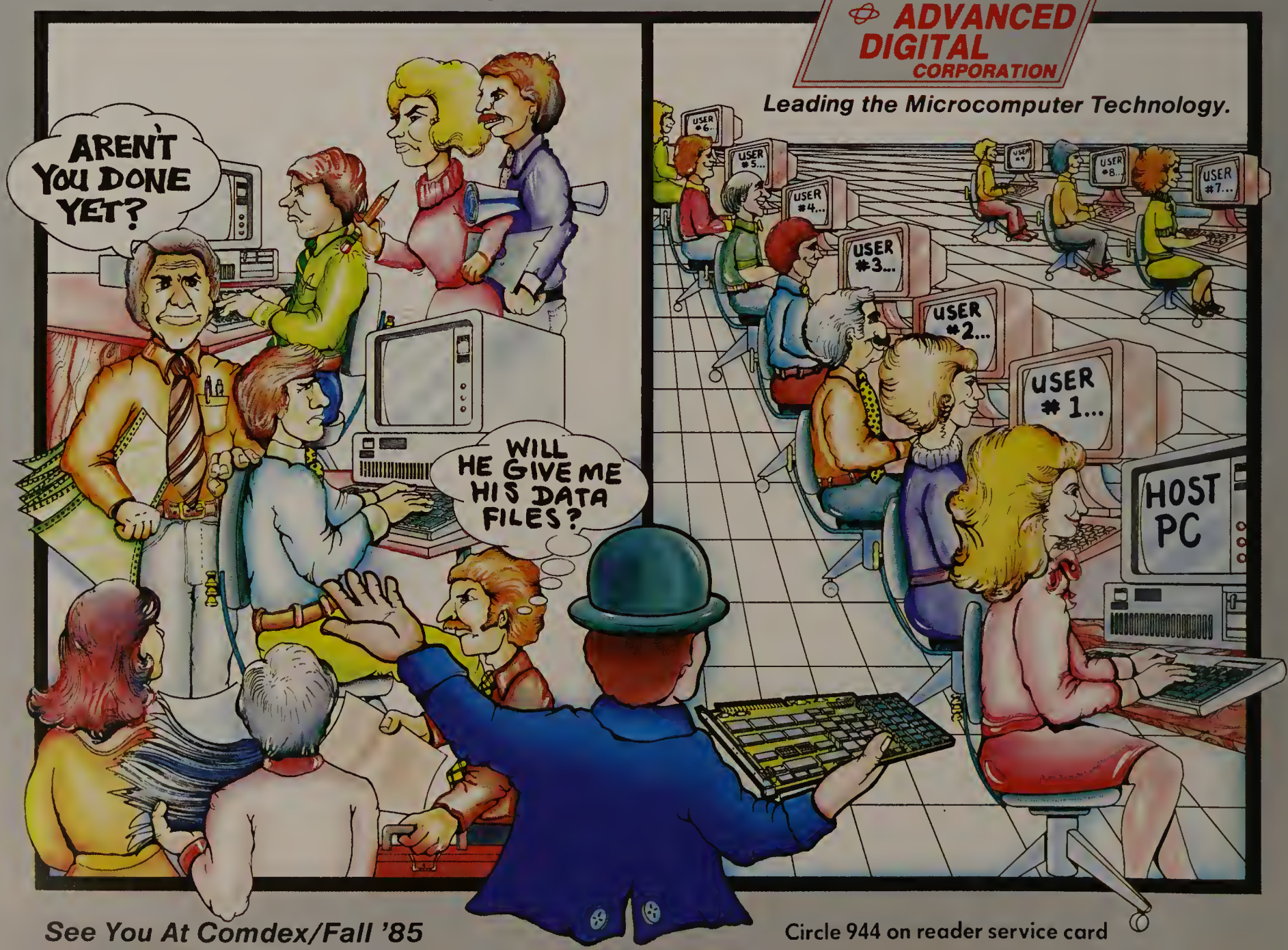

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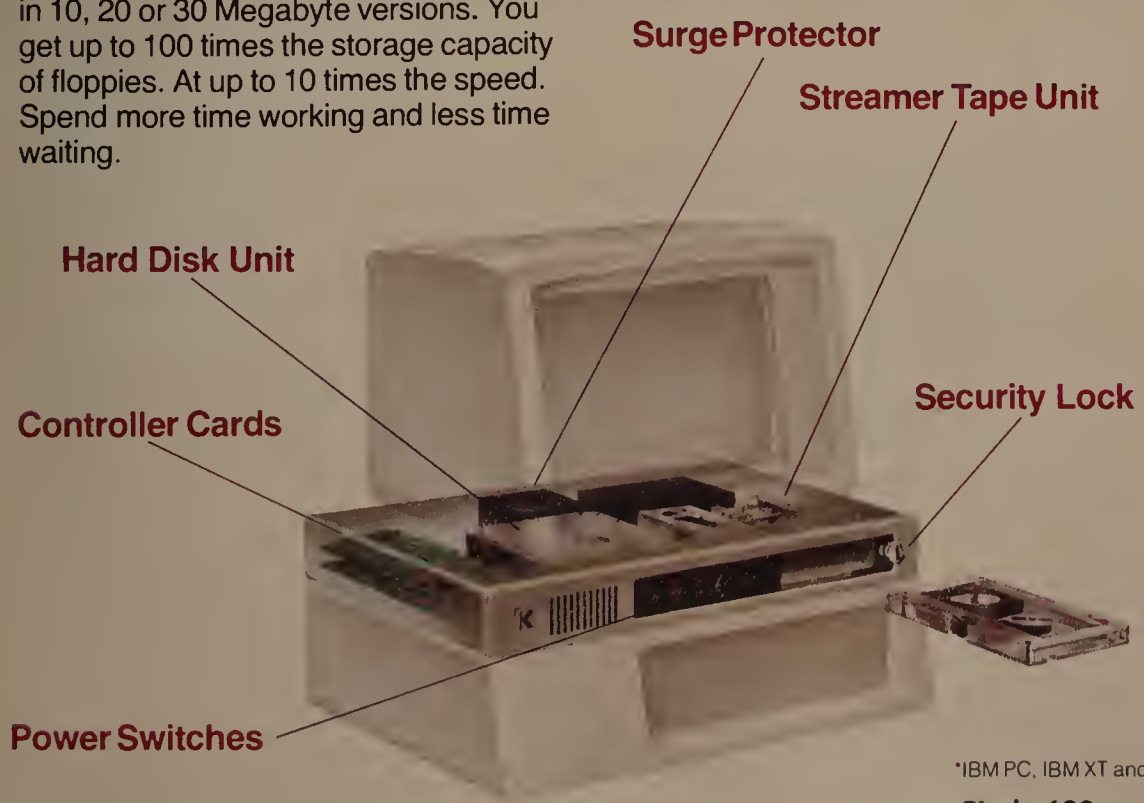

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PC WORLD

The Comprehensive Guide to IBM Computers and Compatibles
October 1985

130 **World Class PC**

In our third annual contest, readers honor 40 hardware and software products that measure up to the World Class standard. *PC World* also awards $36,000 worth of prizes to four readers selected at random.

160 **Flipping Over Ability**

Why be innovative when you can be right? Xanaro's *Ability* takes the best of software's standard solutions and comes up with an integrated package that's easy to learn for both pros and novices.

216 **Lawyers On Line**

Now you can tap the Lexis and Westlaw legal data bases with a PC. Careful search strategies make on-line legal research cost-effective as well as convenient.

Getting Started

116 The Cookie Cutter, *Ron Feldman*
Spreadsheets are ideal vehicles to help you define and monitor manufacturing flow and inventory—and keep your business rolling in dough.

124 PBX: The Network Switch, *John A. Merritt*
Before you commit your company to the LAN solution, consider the network alternative—the PBX already in your office.

Community

130 World Class PC, *Christine Whyte*

146 Europe: Accent on Competition, *Janette Martin*
For computer companies on the Continent, the spirit is willing but the fiscal setting is weak.

Review

160 Flipping Over Ability, *Bill Crider*

170 Maximum Returns, *Ralph Soucie*
CPAs arise! Cast off your service bureau shackles! Professional tax software for the PC is here—if you can afford it.

178 A 1-2-3 Foursome, *William Urschel*
Four template packages transform 1-2-3 into ready-to-ware applications.

186 On the Trail of the Datavue 25, *Eric Brown*
Quadram's 14-pound portable survives jeeps, snakes, and storms in the jungles of South America.

192 Every Word a Key, *Bill Crider*
Two programs search every file on your hard disk for any word you specify. *ZyIndex* and *4-1-1* manage documents for easy access.

196 Present WordPerfect, *Terry Datz*
New features and continued agility work in tandem to deliver an efficient new word processor.

State of the Art

208 MIDI: The Music Interface, *Warren Sirota*
A digital interface standard opens a gateway between synthesizers and PCs.

Hands On

216 Lawyers On Line, *Jordan J. Breslow*

224 Retrofit Your PC, *Jeremy Joan Hewes*
Tranform your PC into an XT or an AT with hand-picked hardware.

Departments

11 David Bunnell

29 REMark, *William Rodarmor*

53 John C. Dvorak

69 Letters

86 PC World View, *Ken Greenberg*
In CPUs IBM goes in for the kill.

99 The Help Screen, *Karl Koessel*

234 From the Software Shelf, *Edited by Robert Luhn*
The ultimate financial game

255 From the Hardware Shelf, *Edited by Robert Luhn*
Notes from a turbo kind of a guy

281 Password: Communicate, *Edited by Eric Brown*
The AMA goes on line, IBM takes MCI, and how much is that doggy in the window?

311 *.*, *Edited by Steven Cook*

PC World Directory

335 A classified guide to products and services

Index

347 Advertisers

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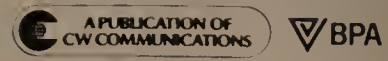

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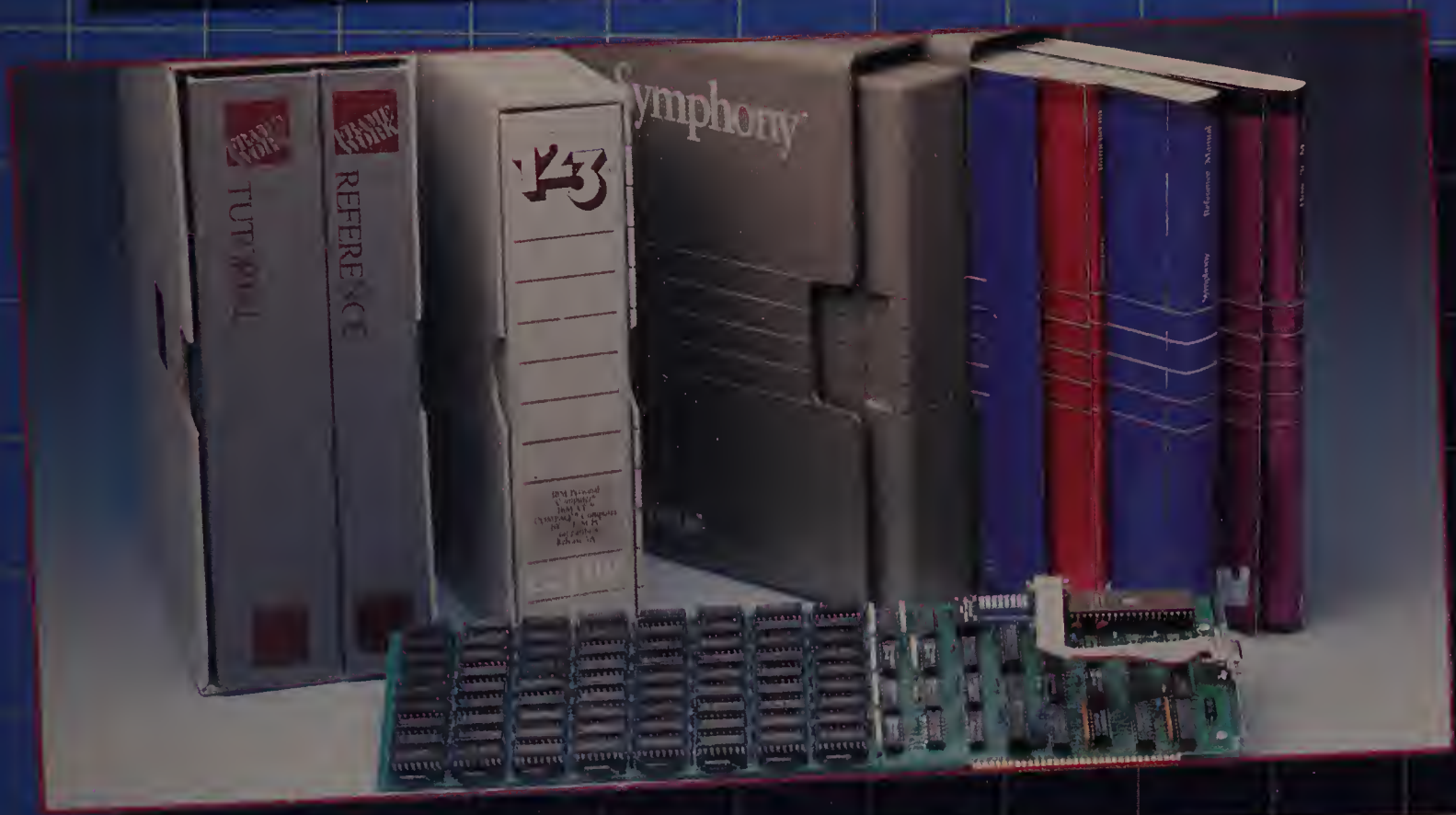

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David Bunnell

Tribute to a Great Friend

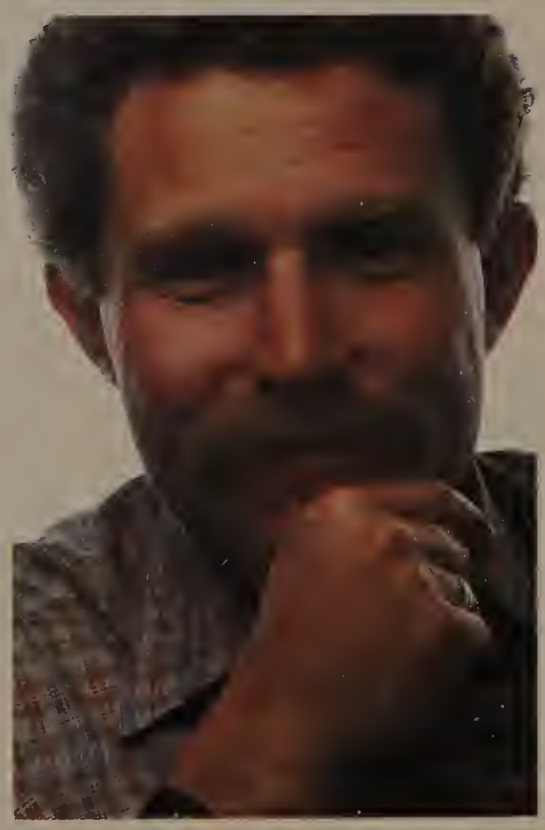
The computer industry has lost a powerful and prophetic leader, but his influence, vision, and dedication will live on.

Andrew Fluegelman is gone. The founding editor of both *PC World* and *Macworld* and cofounder of our company, Andrew died suddenly at age 41.

Andrew was known far and wide in the personal computer industry. The day we were notified of his death, I happened to receive an envelope from our publicity department stuffed with press clippings containing references to him.

Andrew created the notion of Freeware—a wonderful concept of sharing and marketing software—when he decided how to distribute his *PC-Talk*, the first easy-to-use yet powerful communications program for the IBM PC. The marketing technique and the program are both milestones in personal computing history and will live on for many years.

Nationally known for his software exploits, Andrew contributed to the quality and success of our two magazines in ways that can be understood and appreciated fully only by those of us who worked closely with him. While creating *PC World* and *Macworld*, we relied heavily on Andrew's writing and editing expertise, his wonderful insight and judgment, and his amazing computer skills. We trusted him implicitly.



Andrew Fluegelman, a man for all seasons

We couldn't have done it without you, Andrew.

Literally 2 minutes after *PC World* cofounder Cheryl Woodard and I shook hands with IDG

(continues)

A SLEEK NEW STRATEGY FOR

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TAPE: PC/T

chairman Pat McGovern to clinch the agreement to start PC World Communications, I called Andrew and asked him to join us as one of the company's founders. That phone call turned out to be one of the wisest moves I've ever made.

Andrew brought us a superb sense of style. He increased our understanding of the profound importance of maintaining high standards of integrity, appropriate discretion, and absolute honesty. His brilliant reviews of IBM's *EasyWriter* and Lotus's *Symphony* were scathing, yet the people who knew him from those companies were among the friends most shocked and saddened by his death.

Just last April I had the opportunity to spend a week with Andrew in Japan. Perhaps because it was just the two of us facing the mysteries of Japan's culture and its electronics industry, I am able to bring back wonderful memories of Andrew that will always remain with me.

Andrew took to Japan the way he did to computing–like a duck to water. Though we were able to study Japanese for only a few hours on the plane, by our third day in Tokyo, he was already tossing off Japanese expressions as though he had traveled extensively in Japan. I have no doubt that if we had been able to stay for a few weeks, Andrew would have spoken fluent Japanese.

Andrew was always willing to listen. His innate courtesy helped us form strong relationships with several key people in Japan.

And throughout the trip, Andrew maintained a delightful playfulness and good humor, the same characteristics that many of his friends remember fondly.

For instance, as we drove back to the train station after visiting the Yamaha factory in

(continues)

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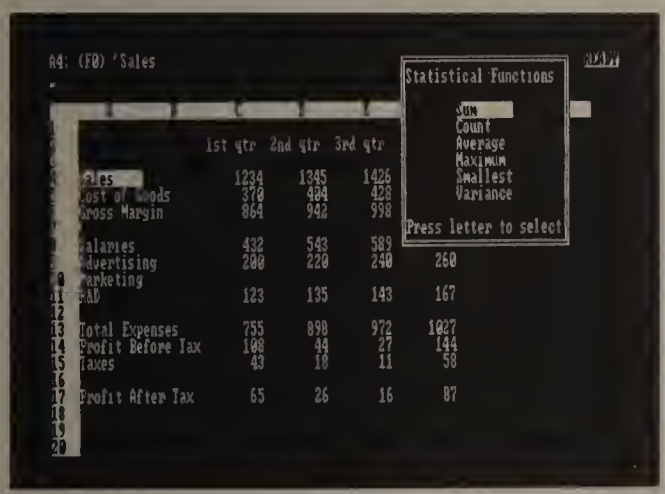
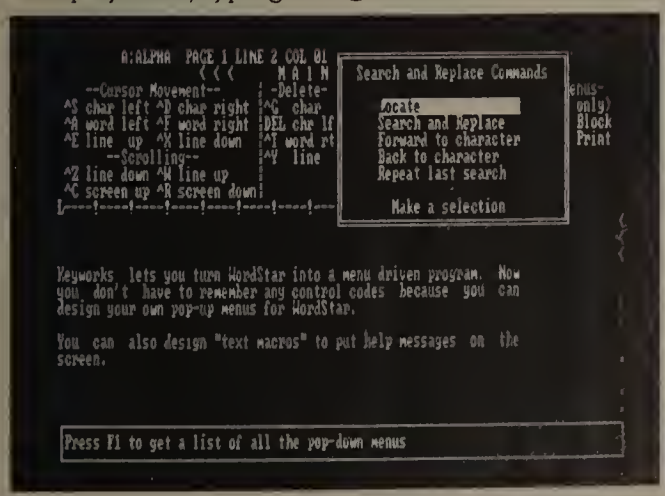


If you're in Lotus 1-2-3, you could pop up a menu, select Count and your macro would play back, typing out @ COUNT(.



Or you could simplify your WordStar control codes by designing your own menus.

Design your own menus

All keyboard macro programs let you record long sequences of keystrokes and then play them back with a single key. But Keyworks takes the simplicity of macro programs a giant step further. With Keyworks, you can actually design your own menus and pop them onto the screen whenever you need them. Commands are never overly complex or confusing, because Keyworks lets you simplify them.

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Keyworks also offers you access to all common DOS functions from within your program. Imagine being able to format a disk or check a directory without having to exit from the program you're working in!

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Ejection from F-16 (Control Tower View)

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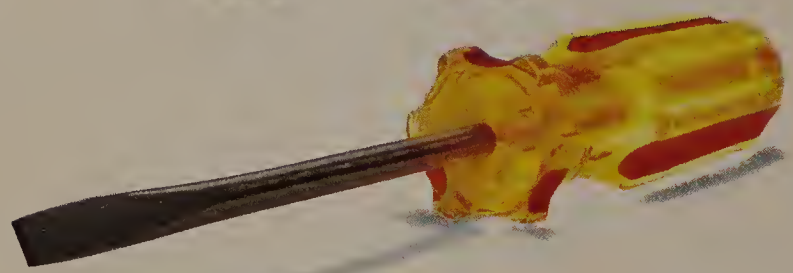

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Circle 13 on reader service card

Hamamatsu, Andrew noticed a sporting goods store with Japanese baseball caps in the window. Even though we were in danger of missing our train—and therefore our return flight to San Francisco—Andrew had the taxi driver pull over to the side of the busy road. Together with our guide, Yasuo Ohira, we dodged the traffic to run into the shop. After quickly trying on caps and buying some, we rushed back to the taxi. We ended up having to charge up several flights of stairs to catch the train. But it was worth it. Once on the train, Andrew, the baseball caps, and I received long stares from the locals, who thought we were *gaijin,* American baseball players who play on Japanese teams.

A man of many talents and interests, Andrew led an incredibly full life. He loved the Grateful Dead, sushi, football, and kayaking on the San Francisco Bay. But baseball, in the form of the San Francisco Giants, was his consuming passion. Once he told me that if he were disabled and had to spend the rest of his life in a wheelchair, I should just roll him out to the ballpark, and he'd be happy.

As a self-appointed historian of personal computers, I intend to ensure not only that Andrew's contributions are remembered, but that they continue to make an

(continues)

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COMPARE:	Princeton SR-12P	IBM 5175
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Sugg. Retail Price (The lower, the better too!)	$999	$1295
Warranty	1 Year	90 days

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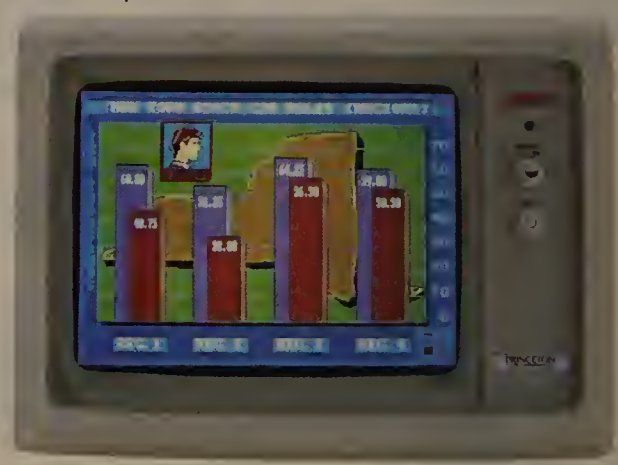

COMPARE:	Princeton HX-12E	IBM 5154
Dot pitch	.28 mm	.31 mm
Sugg. Retail Price	$785	$849
Tinted Black Matrix Tube	Yes	No
Warranty	1 Year	90 days

Ideal for most computing applications, the HX-12E offers 64 high-resolution colors and easy-to-read text. Compare Princeton's quality to IBM's...

Princeton HX-12E

IBM 5154

The HX-12E gives you sharper colors, crisper characters...for less eye strain and easier viewing, hour after hour. Built-in versatility also allows you to display 16 colors with the IBM Color Graphics Adapter* automatically.

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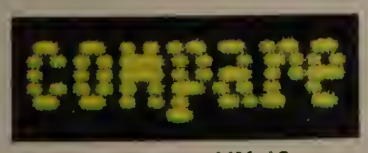
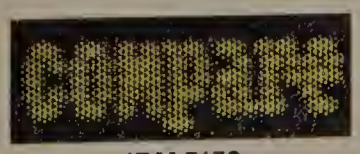


Princeton HX-12



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impact on the industry. For this reason I have asked some of Andrew's friends and colleagues to help establish an annual Andrew Fluegelman Award.

This award, which we hope will include a substantial cash prize, will be presented to the software author whose work best exemplifies outstanding programming and shows dedication to furthering the personal computer community. If you would like to make contributions or help participate in creating the Andrew Fluegelman Award, please write me in care of this magazine.

The people who worked with Andrew, read his articles, or continue to use his communications program gained a lot from him. And with a little help from his friends, Andrew Fluegelman and the example he set for all of us will live on among personal computer users, the industry, and perhaps even humanity.

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REPORT with one lookup to a second table stored to a file.	6 minutes, 49 seconds	11 minutes, 8 seconds
PRINT a report of sorted data with subtotals.	6 minutes, 39 seconds	10 minutes, 30 seconds
TOTAL (All functions performed in sequence.)	14 minutes, 1 second	22 minutes, 57 seconds

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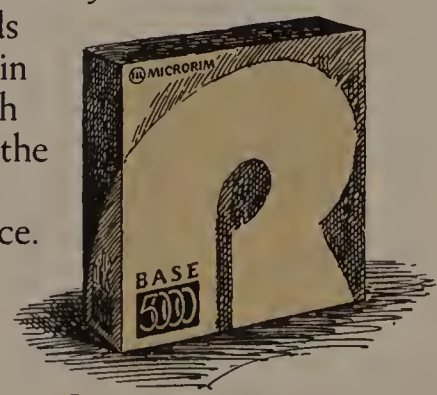

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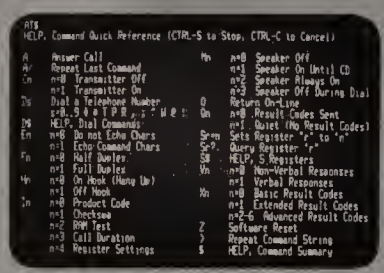

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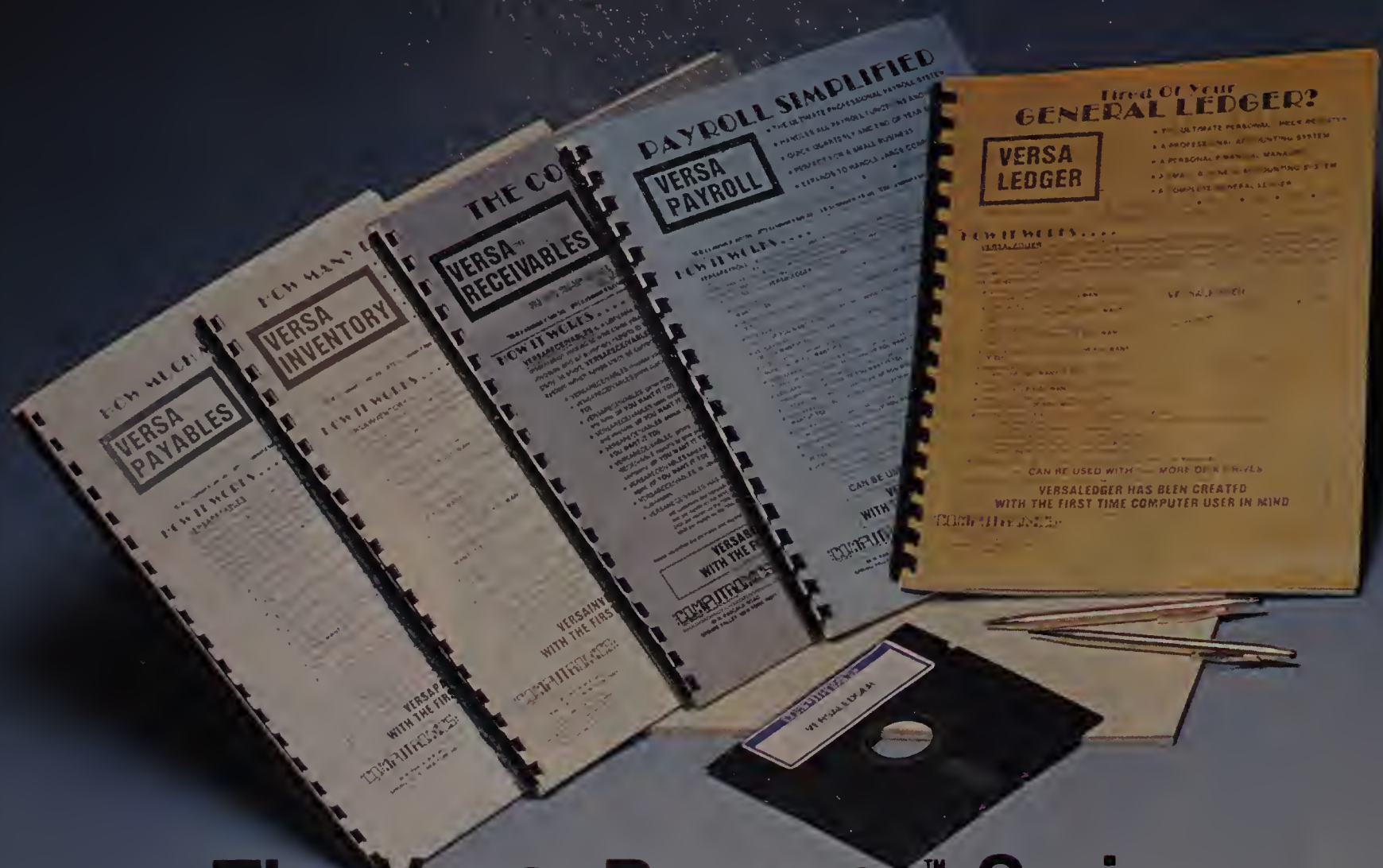

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William Rodarmor

REMark: Sermons and Soda-Water

As Silicon Valley leads the nation in toxic waste dumps, the "clean" industry needs to reexamine its methods of production.

Like a weekend drunk, the computer manufacturing industry is suffering a fate Lord Byron described nearly two centuries ago: mirth and laughter on Saturday night, sermons and soda-water on Sunday morning. What initially looked like a "clean" industry has turned into a major source of pollutants and toxic wastes. The heady days of mirth and laughter are giving way to grim sermons and soda water—and in some communities, bottled water.

When it first appeared on the scene, the computer industry promised jobs and growth without unsightly smokestacks. Sleek, low buildings spread in tasteful ribbons along Route 128 in Massachusetts and Silicon Valley in California. The industry promised to revolutionize the workplace, and it did. Money followed money, and the boom was on.

Then the fish died.

In May 1978 about 100 fish turned up poisoned in Stevens Creek, a seasonal Silicon Valley stream. An investigation found a highly alkaline substance in the water and traced it to a Fairchild computer chip manufacturing plant. Under pressure from the California Fish and Game Department, the company cleaned up the mess, but without admitting liability. Press coverage of the spill was minimal.

Meanwhile, the industry was hitting its stride. Microcomputers were showing up in schools and offices across the country. Few people worried about environmental pollution, much less the risk to workers exposed to chemicals used in chip manufacture. The boom times were too good, the future too bright.

Then the bubble burst. In early 1981, an unusual number of birth defects started showing up in Los Poseos, a neighborhood in south San Jose. As luck would have it, the finger was again pointed at Fairchild. For the first time in Silicon Valley's history, spilled chemicals had leaked into a public water supply.

Suddenly, high-tech pollution was a hot subject. Day after day, spills and toxins associated with

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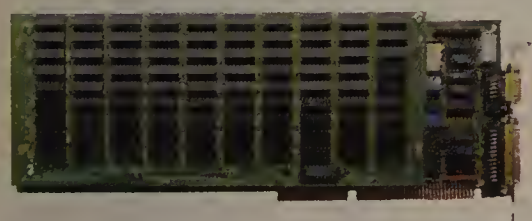

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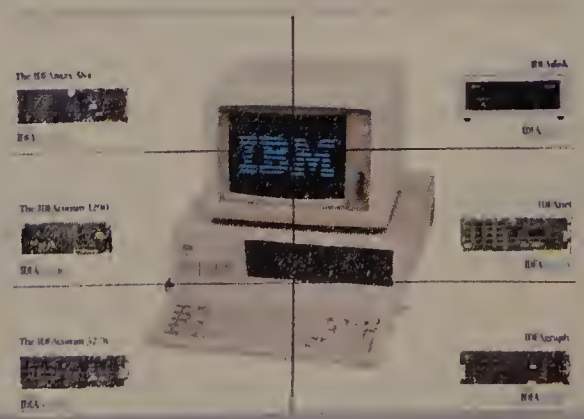

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the electronics industry made the front page and the evening news. Public officials belatedly took notice. In San Jose, IBM spent $20 million cleaning up a nearby spill. The "clean" industry was beginning to look filthy.

To their credit, the manufacturers did more than circle their wagons. When the Fire Chiefs Association of Santa Clara County set up a task force in 1982 to develop a model ordinance regulating chemical handling, a committee of industry groups, chaired by Larry Borgman, Intel's manager of plant facilities, joined to help.

Most of the companies checked their sites on a case-by-case basis, but as a group they worked on prevention. "The approach we took is that what you're storing in a tank isn't supposed to get out of the tank," said Borgman, "no matter what it is—even water."

As a result, every Silicon Valley community has strong regulations on double containment of underground tanks, disclosure of the chemicals used, and monitoring of leaks. Meanwhile, the Environmental Protection Agency has allocated $1 million to study groundwater pollution at 92 sites in Silicon Valley. The EPA plans to put 19 sites on its Superfund cleanup list, giving Santa Clara the dubious distinction of having more pollution sites than any county in the nation.

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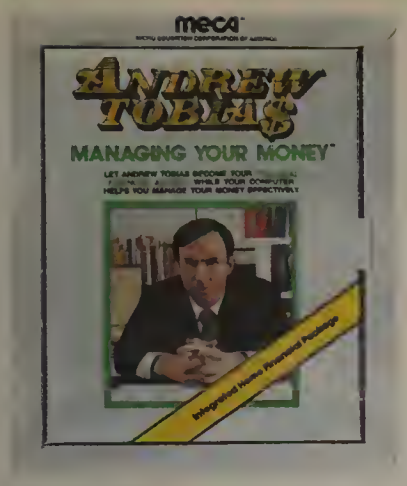

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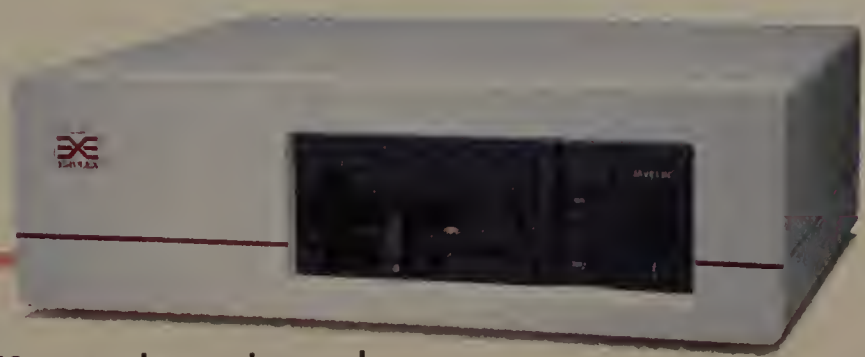

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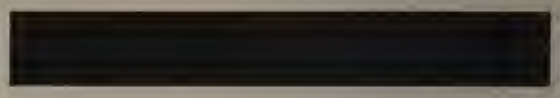

But it may be a case of too little, too late. Press coverage of high-tech pollution has dwindled, but new dangers continue to appear. In 1982 a plume of contaminated groundwater half a mile wide and a mile long was discovered near the Silicon Valley town of Mountain View. The pollution is believed to have come from leaking underground tanks at a cluster of five local electronics firms: Fairchild, Intel, NEC, Raytheon, and Siltec. Initially, the plume was thought to be relatively shallow, because a layer of clay 50 feet down covers the deep aquifer from which Mountain View draws its drinking water. But new evidence suggests that the clay barrier itself may have been breached.

A test well drilled into the deep aquifer recently turned up evidence of contamination, and Mountain View is now worried that the pollution may be percolating down through the clay barrier, possibly through abandoned wells. The electronics companies are squabbling among themselves over which one is responsible for the cleanup.

"We were told that computer manufacturing would provide steady jobs and no smokestacks," says Ted Smith, an attorney who heads the watchdog Silicon Valley Toxics Coalition. "In fact, they buried the smokestacks and forgot about them. And now we've discovered that was a very bad thing to do.

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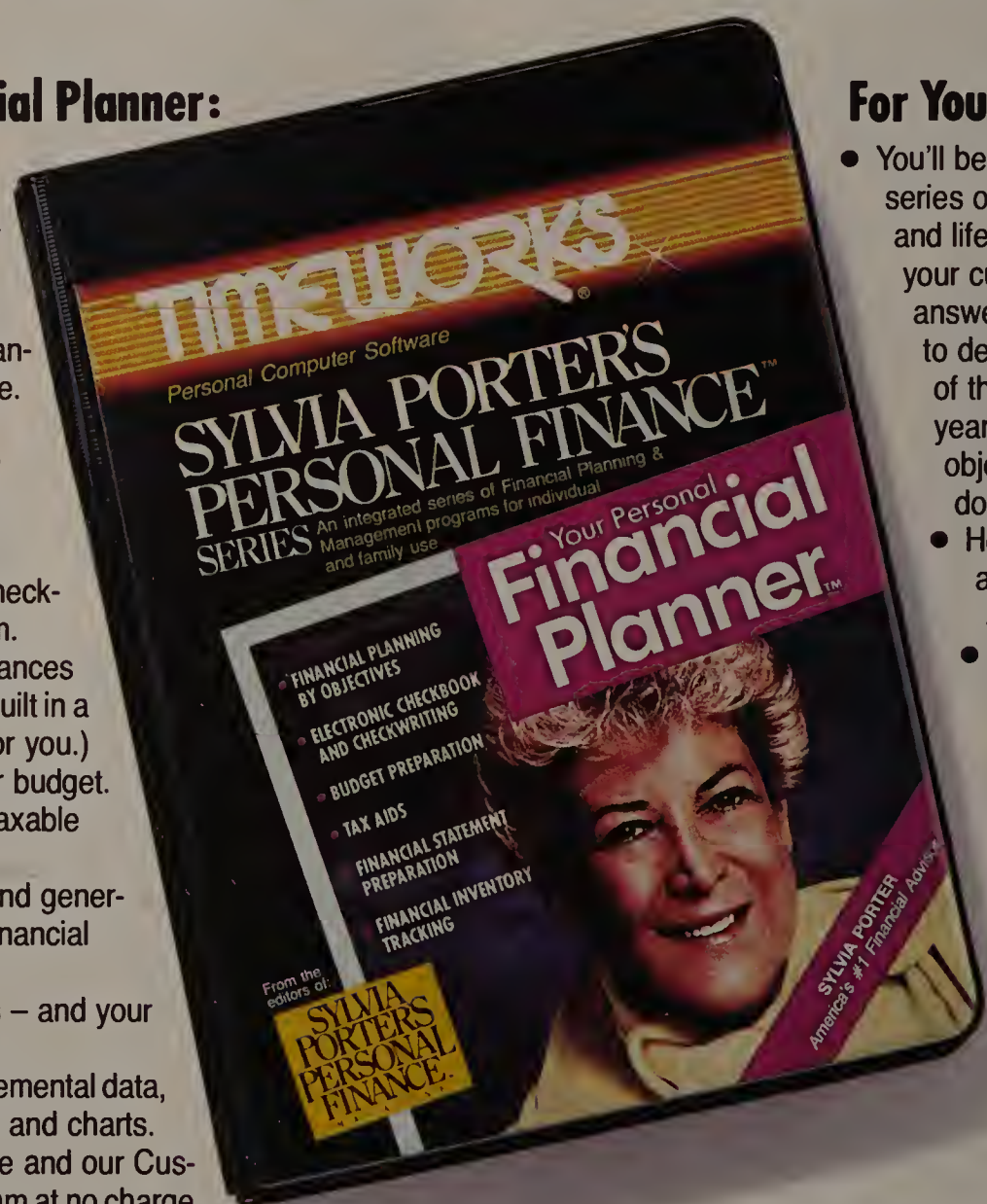

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"To a greater extent than ever, the computer industry is hooked on the toxic treadmill—a total dependence on chemicals that we know can cause cancer and birth defects."

To be fair, in a number of cases the industry has tried to use less toxic chemicals, but the result looks like a game of catch-up. For years carbon tetrachloride was the commonly used solvent in chip manufacture. When carbon tet was implicated as a health hazard, the industry switched to trichloroethylene (TCE). When TCE in turn was discovered to be an animal carcinogen in the mid-1970's, the industry phased it out in favor of another solvent, trichloroethane (TCA). It now looks as if TCA may be connected not only with cancer but with birth defects as well.

Other changes in manufacturing may be making the problem worse, not better.

To replace the silicon in microwave chips, the industry is currently looking at a substance called gallium arsenide. As its name suggests, it is an arsenic derivative and highly toxic. A Boston firm called M/A Com is one of 50 companies nationwide that is involved in developing the gallium arsenide process. On June 22,

(continues)

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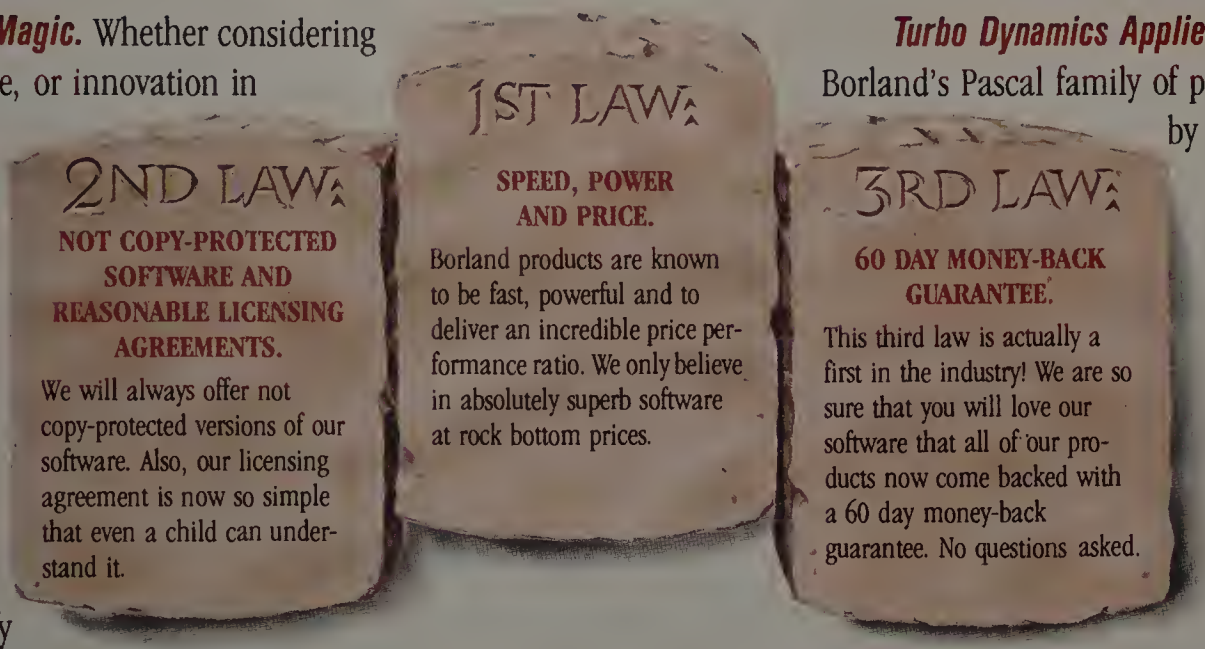

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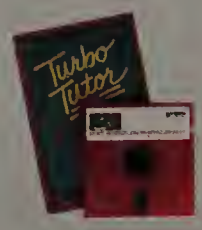

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8:00 am. You got to work on time, despite the 44-mph turkey ahead of you in the fast lane. It's spreadsheet time. You hit one key. Lotus 1-2-3 (or whatever) is up and running. (One key, because SuperKey has recorded all the CD\123 <ENTER >123< ENTER> <ENTER> / F <ENTER> R <ENTER> SALES <ENTER> <PgDn> foolishness and your one keystroke played all that back instantly. One keystroke instead of a minuet).

8:03 am. You're into the spreadsheet. Phone rings. You kick in SideKick's Notepad—without leaving your spreadsheet. You talk. You listen to Frank. You make notes that tell you that Frank is upping the numbers from yesterday's order and he needs a new price and delivery date. He wants a meeting. Fast, but when? You have SideKick fire up your Calendar. Time agreed and noted—in SideKick's NotePad. Conversation ends. Your spreadsheet is still there.

8:07 am. You're watching the spreadsheet but you're thinking about the new bid you have to figure out. So you have SideKick's Calculator pulled up on the screen—over a small piece of the spreadsheet—which doesn't go away.

8:08 am. SideKick is coming up with new numbers. SuperKey keeps the spreadsheet on a roll. Satisfied with the numbers, you have SideKick auto-dial Frank's number. Talk. Talk. Hang up.

8:09 am. Spreadsheet about done. You're watching it, but thinking about what Frank just said on the phone. He liked your numbers. He ordered. He said, "That was fast. We won't need that meeting. (SideKick cancels it from your Calendar). And he also said, "How did you get all that done so quickly?" And you said, "I've got a couple of new guys working for me."

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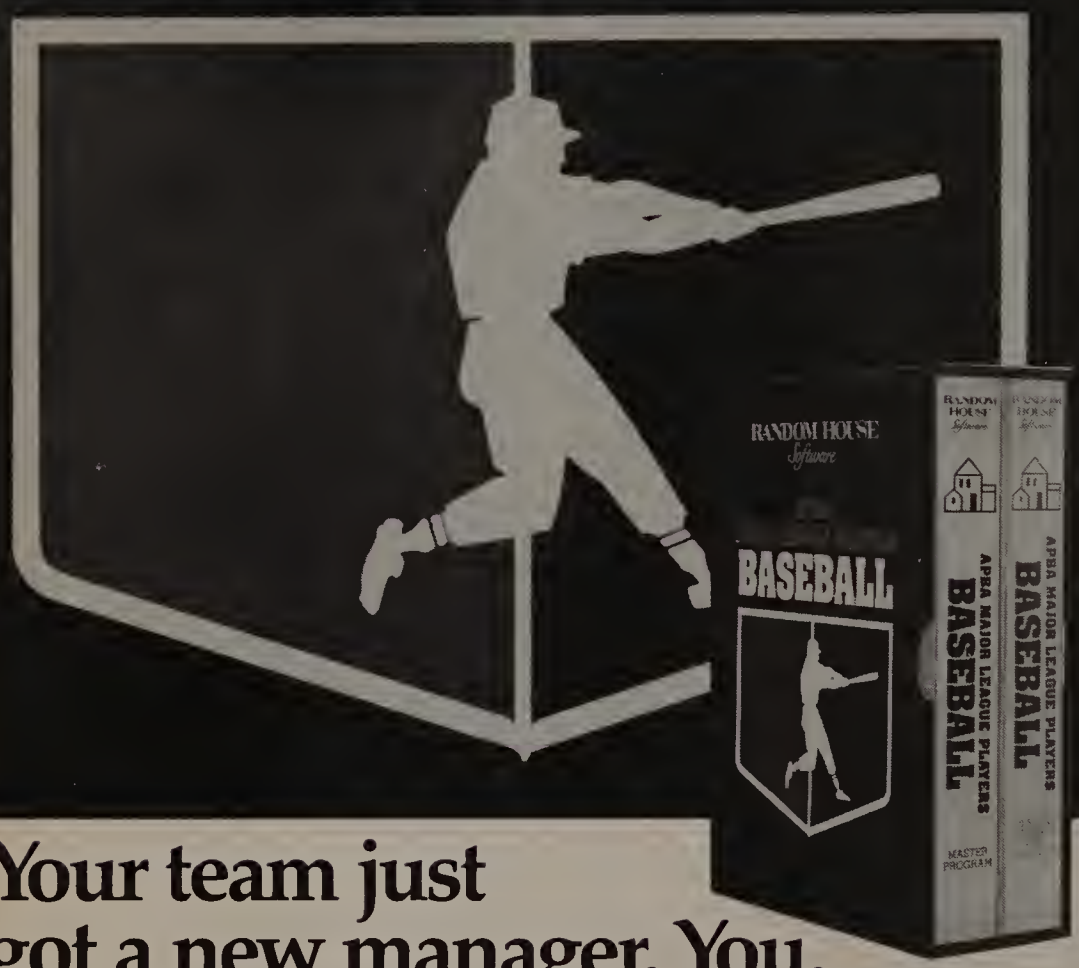

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1984, John Zemotel, who worked at M/A Com in the company's semiconductor division, died of toxic poisoning after he accidentally came into contact with the substance.

So far, industry engineers have mainly focused on the near term, trying to handle toxic chemicals safely or find better ways to dispose of the resulting wastes. But even double-containment tanks won't last forever, and the waste dumps multiply every year. Critics say the real solution lies in finding production methods that don't generate toxic wastes in the first place.

As computer buyers, we have a direct stake in what the industry does. After all, we are at the top of the manufacturing "food chain." We—and our children—are the beneficiaries of high-tech poisons, and unless we bring pressure on the industry to change its ways, we may eventually face sermons and soda water ourselves.

William Rodarmor is a San Francisco Bay Area writer with a special interest in computers and high technology.

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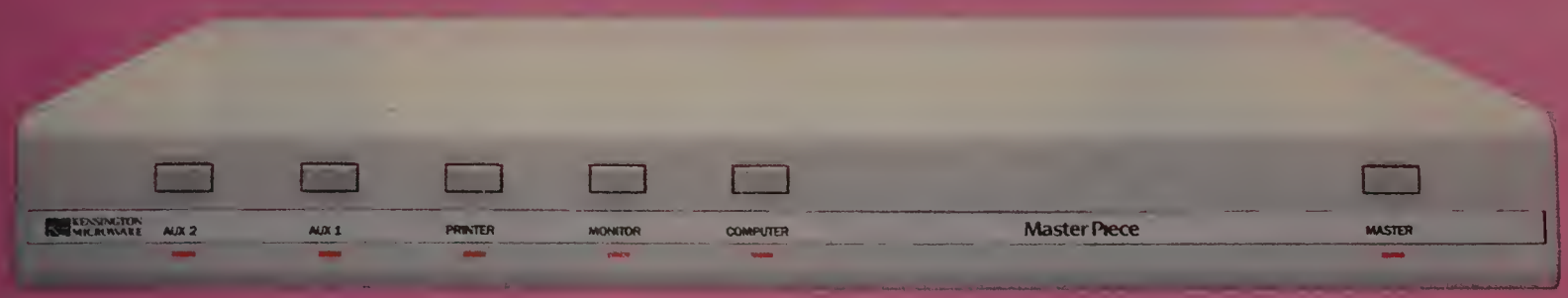

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****	8.3	Chart-Master	Pre.6.1	■	■	■	■	■	192K	$375	✓	✓		26
***	7.8	[redacted]	1.00	■	■	■	■	■	192K	$295	✓	✓		28
***	7.4	[redacted]	4.3	■	■	■	■	■	192K	$595	✓	✓	✓	42
***	7.3	[redacted]	1.3	■	■	■	■	■	128K	$350	✓	✓	✓	32
**	6.8	[redacted]	B.00	■	■	■	■	■	128K	$140	✓	✓	✓	52
**	6.8	[redacted]	Rel.2	■	■	■	■	■	96K	$395	✓	✓		56
**	6.7	[redacted]	3.0	■	■	■	■	■	128K	$375	✓	✓	✓	46
**	6.5	[redacted]	5.0	■	■	■	■	■	192K	$95	✓	✓	✓	36
**	6.4	[redacted]	1.01	■	■	■	■	■	128K	$250	✓	✓	✓	48
**	6.2	[redacted]	1.00/1.03	■	■	■	■	■	512K	$295	✓	✓		44
**	6.0	[redacted]	1.02	■	■	■	■	■	128K	$295	✓	✓		24
*	5.5	[redacted]	3.27	■	■	■	■	■	128K	$450	✓	✓	✓	38
*	5.2	[redacted]	1A	■	■	■	■	■	192K	$495	✓	✓		50
*	5.1	[redacted]	Pre.2.0	■	■	■	■	■	256K	$395	✓	✓	✓	54
	4.9	[redacted]	1.0	■	■	■	■	■	256K	$200	✓	✓		40
	4.5	[redacted]	2.2	■	■	■	■	■	320K	$795	✓	✓		34
	3.4	[redacted]	2.00	■	■	■	■	■	128K	$295	✓	✓		30

Ratings Key

(On a scale of 0 to 10. For methodology, see Page 68.)

OVERALL EVALUATION

***** 9.0 or higher
**** 8.0-8.9
*** 7.0-7.9
** 6.0-6.9
* 5.0-5.9

ALL OTHER RATINGS

■ 7.0-7.9
■ 5.0-6.9
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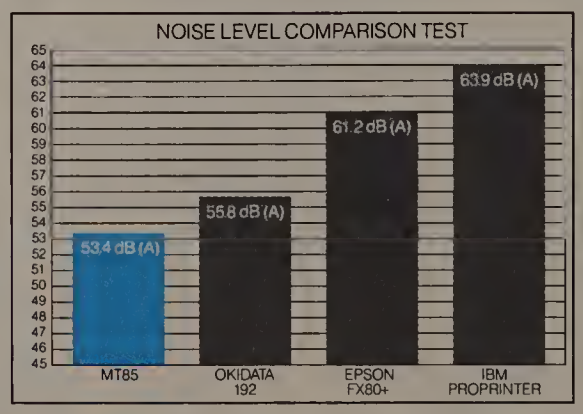

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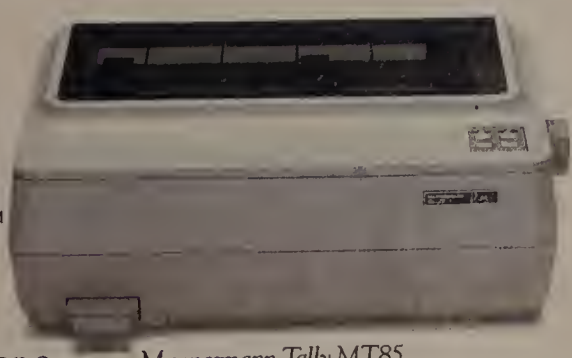

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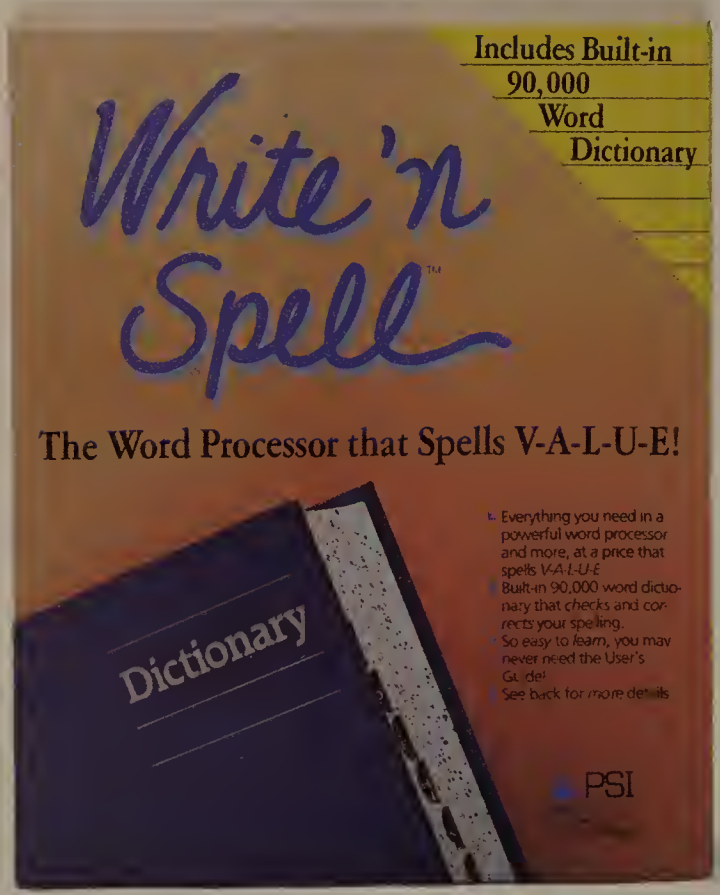

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Circle 145 on reader service card

John C. Dvorak

The Revolution Has Just Begun

The parallels between the histories of the automobile and the personal computer indicate a bright future in store for the PC industry.

Since the beginning of the personal computer revolution, old fogies have argued that the scene is a fad, like CB radios or Hula-Hoops. Fortunately, that's not the case. The country has become so immersed in computing–personally, in business, and for entertainment–that the machines have begun to alter our culture. Even the language of the hard-core computerist has started to infiltrate normal discourse. (Who ever said "data" before the advent of computers? Not to mention the abhorrent use of "interface" or those oft-repeated requests for your "input.")

Few fads result in hundreds of magazines and thousands of books. Only a major trend has the momentum to sustain those classic indicators of acceptance, whereas a fad typically has one manufacturer (and maybe a few imitators) making the dough. How many Pet Rock clones were successful? None.

A major trend has a number of competitive brands and a glut of related accessories. We've seen this with the car as well as the personal computer. The personal computer is no more a fad than the automobile was.

In fact, the histories of the personal computer and the the automobile have significant parallels. The automobile is an ideal standard by which to gauge society's acceptance of a new technology. Automobiles have been so fully absorbed into our culture that everyone can relate to them.

It is no coincidence that the country that has the most cars–a country *symbolized* by the automobile–is the country that pioneered the development of the personal computer. The country that places such high value on personal modes of transportation also prides itself on the concept of "one person, one computer."

Before the automobile, people relied on scheduled mass transportation. (To this day in Europe, you can set your watch by the comings and goings of the trains.) Until the emergence of the now-ubiquitous microprocessor in the mid-1970s, computers were part of large organizations and were controlled by

(continues)

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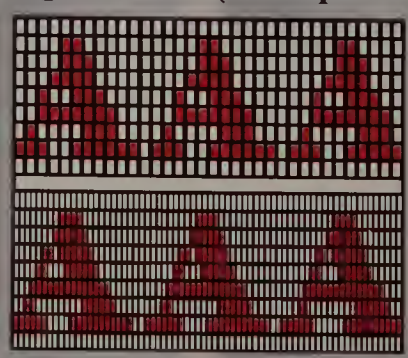

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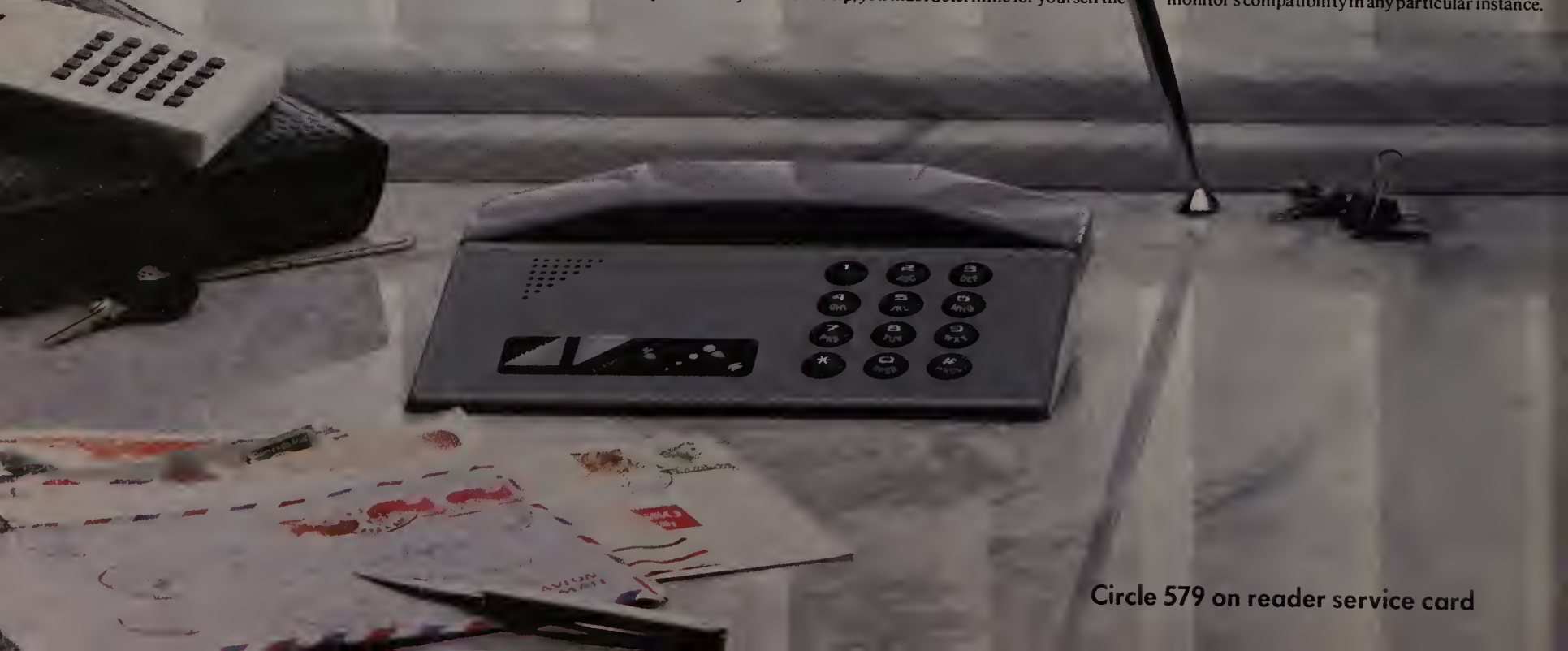

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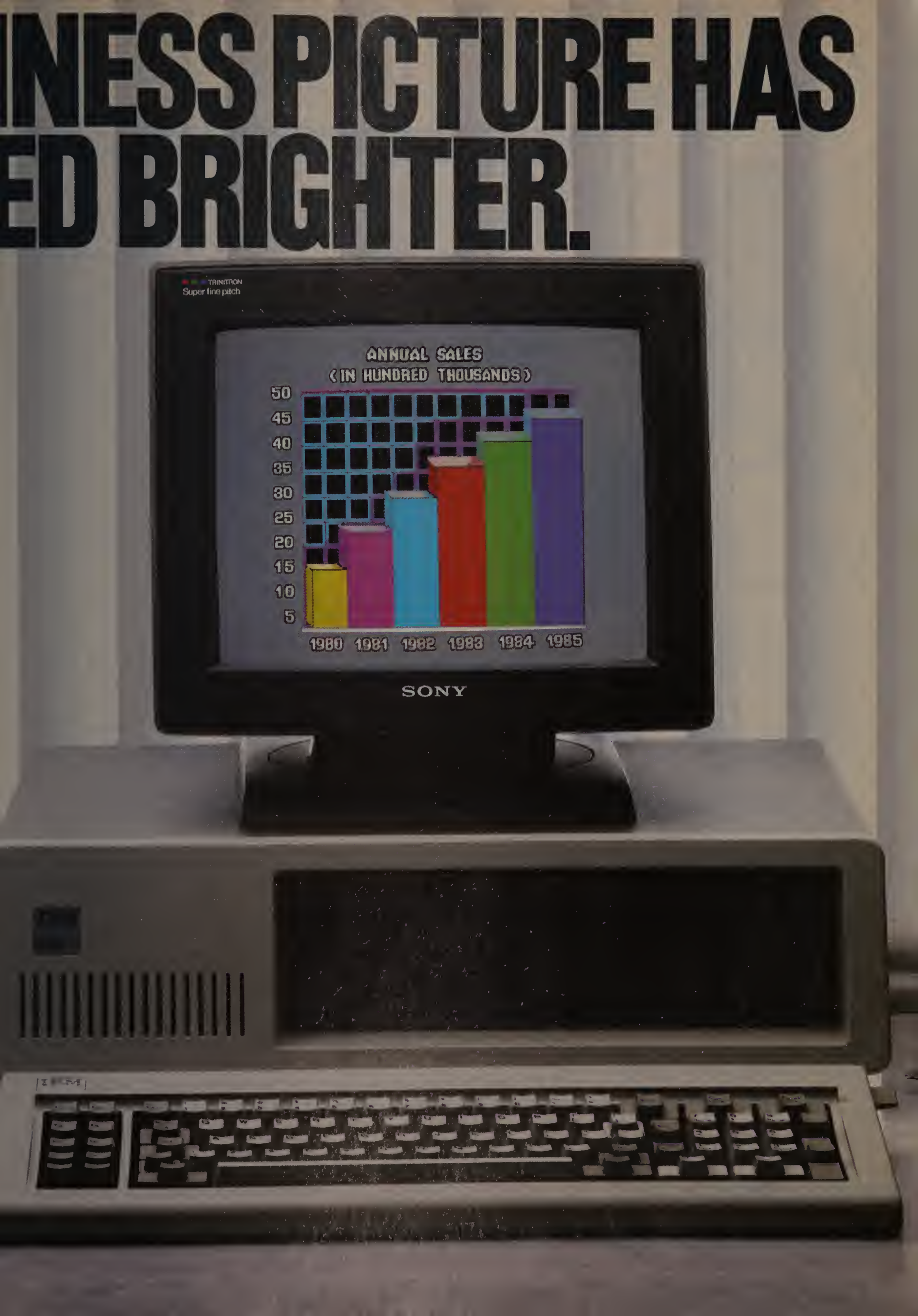

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the data processing priests. Waiting for batch processing was like waiting for a crosstown bus.

Steam trains were certainly large, safe, and powerful, but not as attractive as your own humble jalopy when it came to personal freedom. Large mainframes are analogous to the train (or the jetliner) in that they support a large number of people and are not owned by just one person. Minicomputers are like the Greyhound bus: They carry a considerable number of people and are more economical than the family car.

Even in the 18th century, society possessed a need to personalize modern transportation. Sure, you could always use a horse—it was a personal vehicle, just as a typewriter is a personal word processor. But the technology was available to create a personal vehicle that was faster and better than a horse.

In 1770 a Frenchman named Cugnot invented the first powered land vehicle—a steam tractor designed to pull artillery. With its boiler puffing clouds of steam, it could haul a 5-ton load for about 15 minutes at an astounding 5 miles per hour. The monstrosity reportedly crushed a stone wall during one test, making it not only the first motorized road vehicle but also the first to have an accident. (Insurance rates soared.) The computer equivalent would be the early home-brew, solder-it-together-yourself kits that were as likely to blow up as not.

A slew of screwball steam-powered carriages and stagecoaches came and went during the 1800s. All were heavy clunkers, unusable as personal transportation. Road locomotives, they were called. If the owners weren't killed by an exploding boiler (boiler explosions and consequent deaths were commonplace throughout the period), they might die of boredom waiting for the road locomotive to get up a head of steam: The heavy cast-iron boilers took hours to heat, much as early computer users wasted time toggling in each start-up program, bit by bit.

Soon, near the turn of the century, the gasoline-powered car rolled onto the scene, and with it, a new fellow turned up—the enthusiast. The first years of the automobile age abounded with hobby magazines for enthusiasts. A flood of car-enthusiast magazines appeared between 1900 and 1910—*Motor World, Carriage Monthly, Auto Week, Motor Age, Motorcycle & Automobile Maker and Dealer, Horseless Age,* and dozens of others. The microcomputer industry followed the same pattern—and although some micro magazines have folded, more than 100 still vie for the enthusiasts' loyalty.

Just like microcomputer magazines, most early car magazines appealed to the diehard, tended to be undermanaged, and lacked insight into the business on which

(continues)

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they reported. In 1904 *Horseless Age* wrote about car racing as a "barbarous exhibition." But when the Indianapolis Speedway was built in 1911, car racing became a permanent part of our culture.

I figure we're at about that point with PCs . . . 1911. Although we don't have the computer equivalent of the Indy 500, we have made spreadsheets, *Pac-Man* clones, and video gaming permanent features of the culture. With the next generation of equipment we should be able to invent new uses for the machines and continue on our merry way.

It looks like there's a good distance left to go. Personal computing is still at the beginning of a long growth curve toward acceptance. The PC represents as radical a change as the automobile did, and one that has met as much resistance. Nearly 100 years after the stormy introduction of the horseless carriage, society still finds personal automobiles to be useful and preferable. Thus, demand is still healthy. So let's not get too worried about a few short slumps in the PC market, OK? The growth curve will be rising for a long time to come.

John C. Dvorak is a writer and editor in Berkeley, California. He recently edited Dell Publishing's Dvorak's Instant Expert Series, *and his columns are featured in the* San Francisco Examiner *and* InfoWorld.

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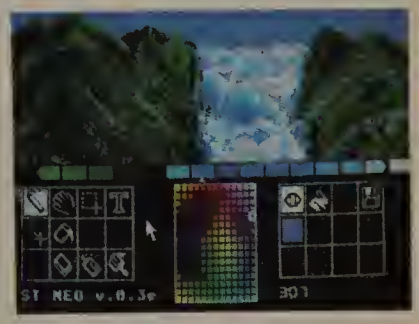

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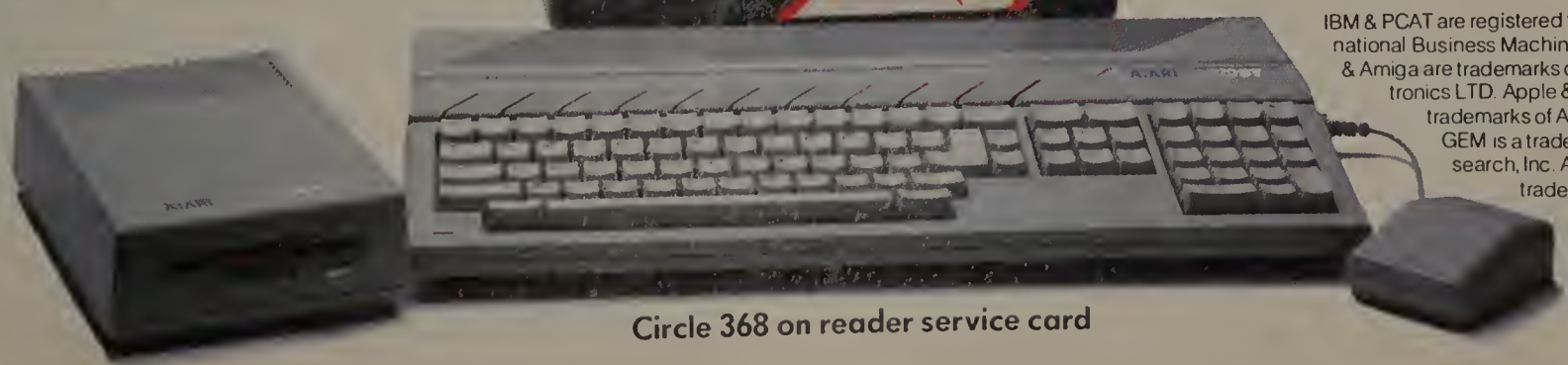

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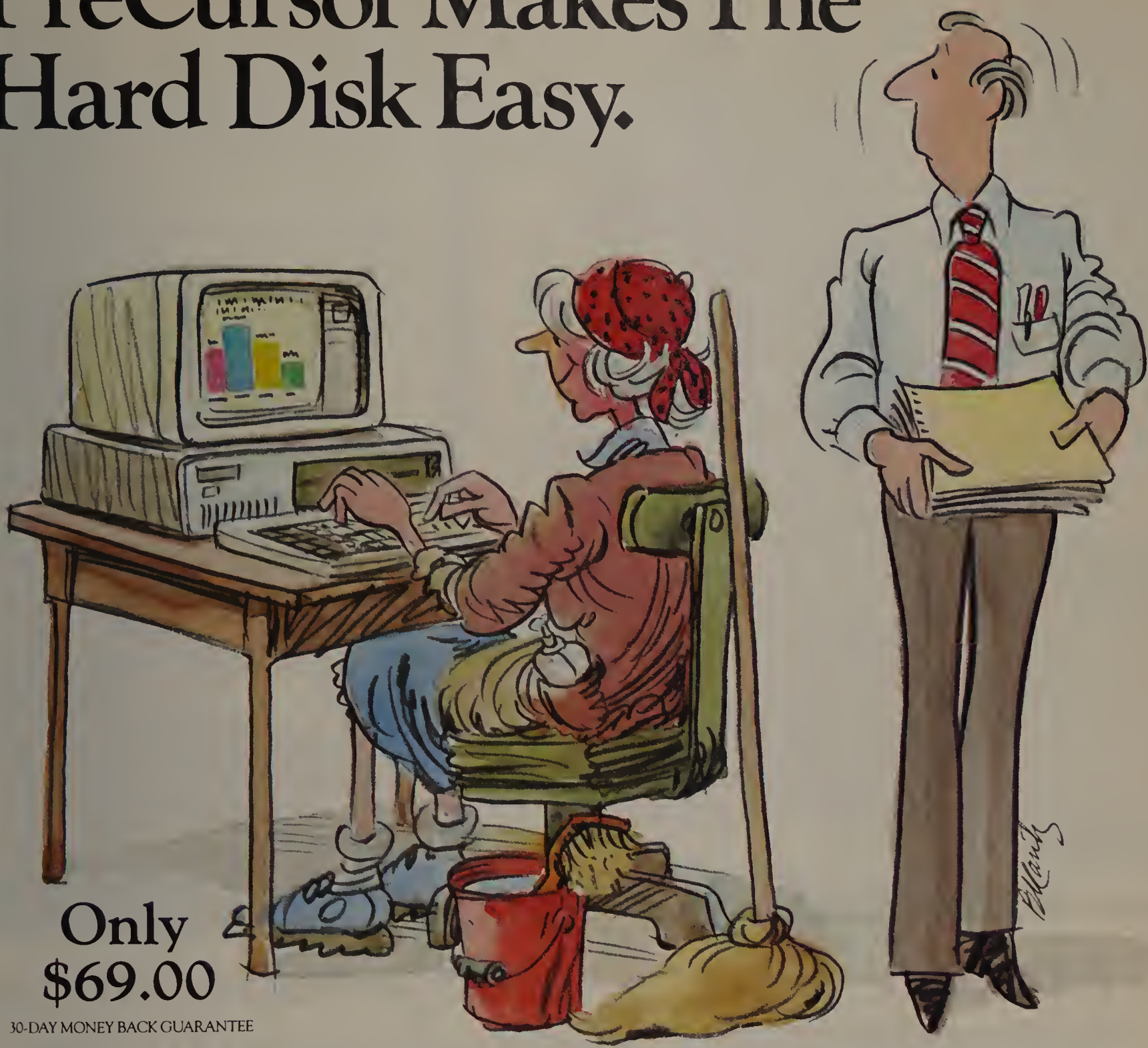

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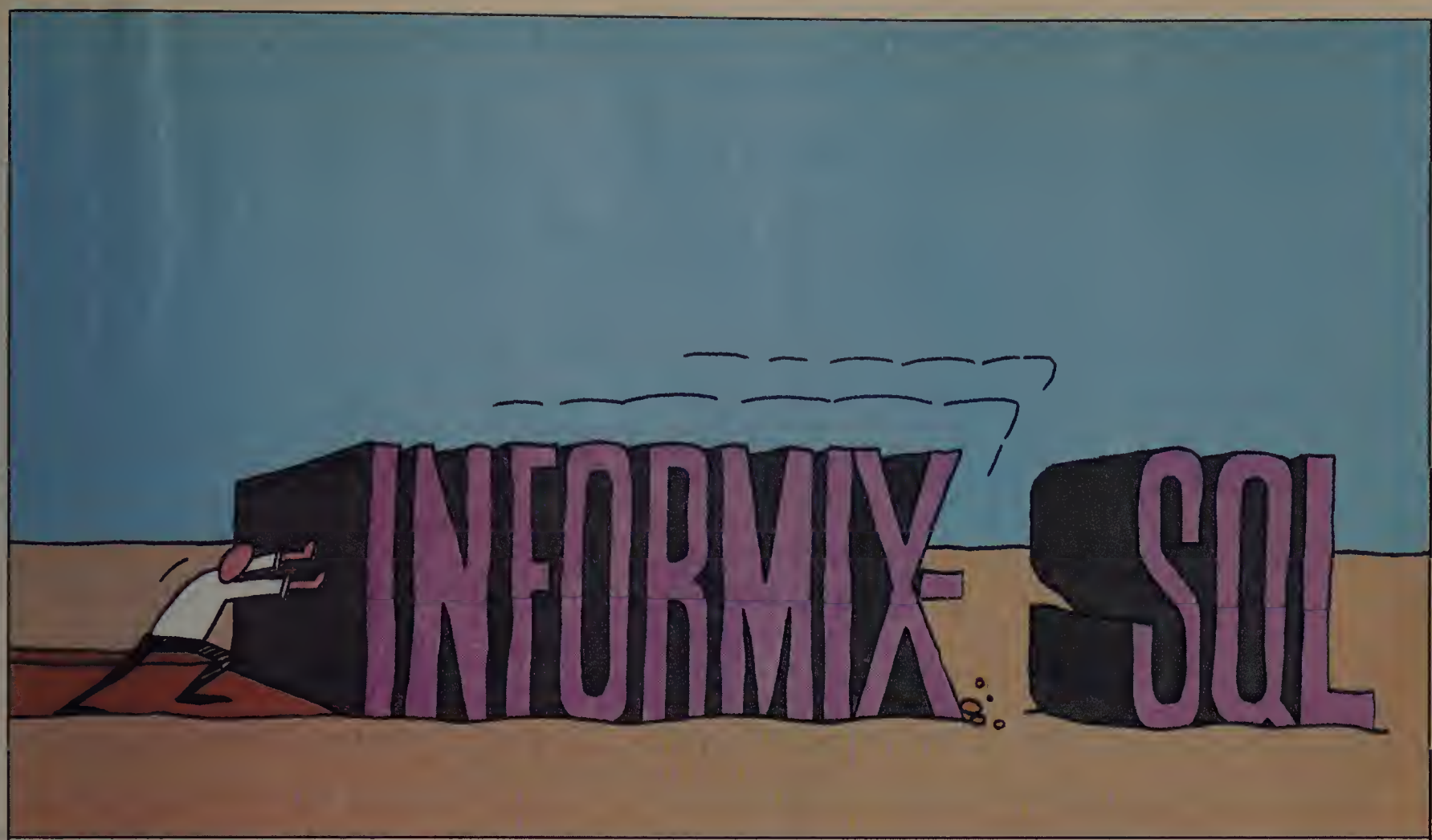

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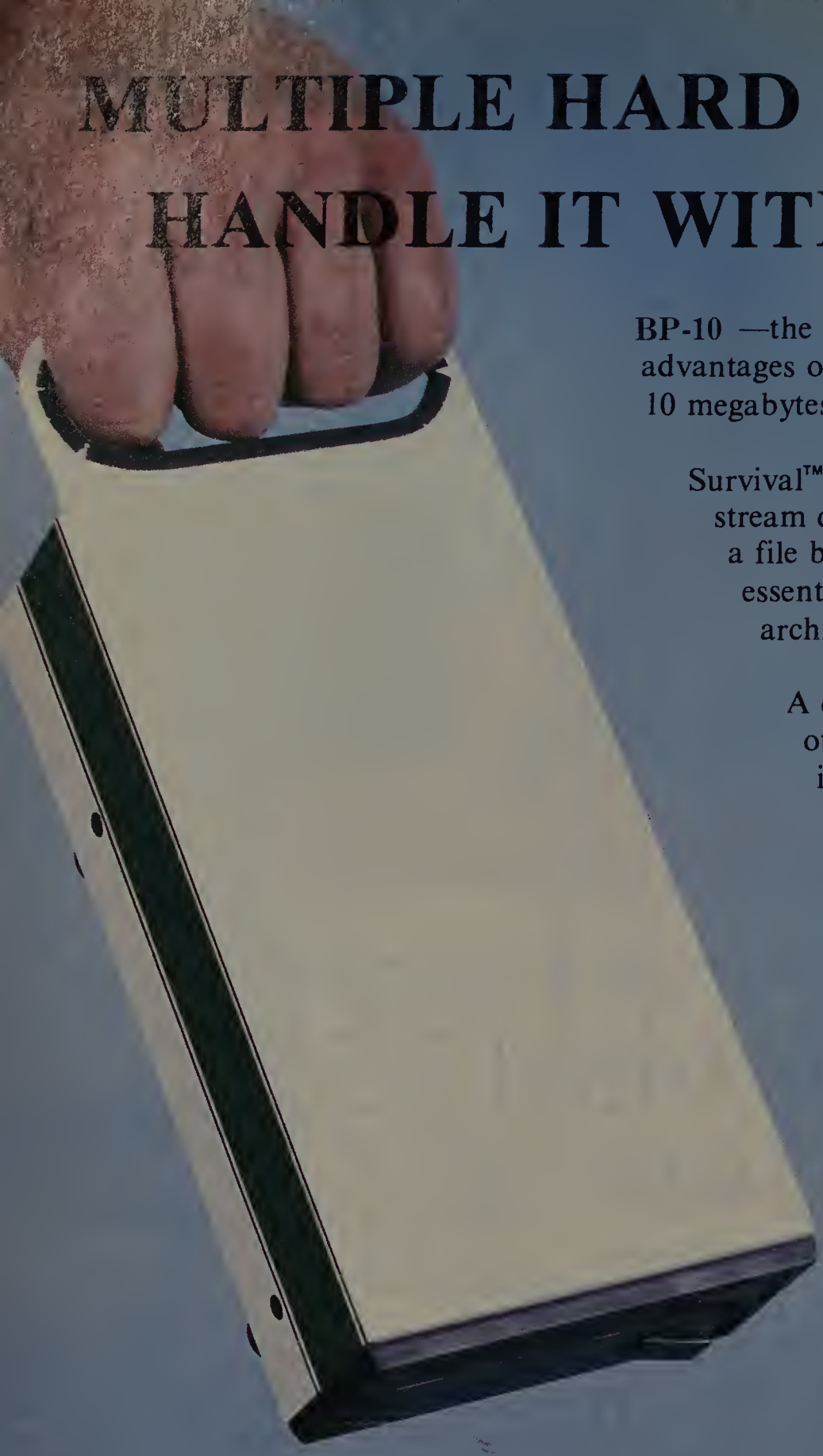

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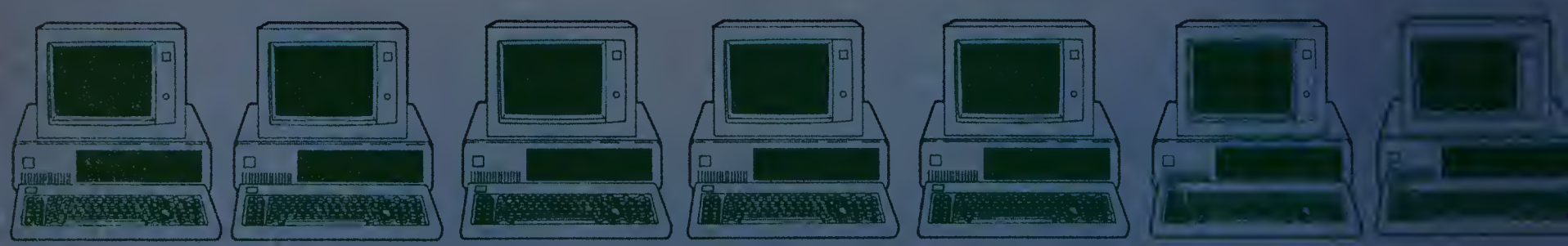

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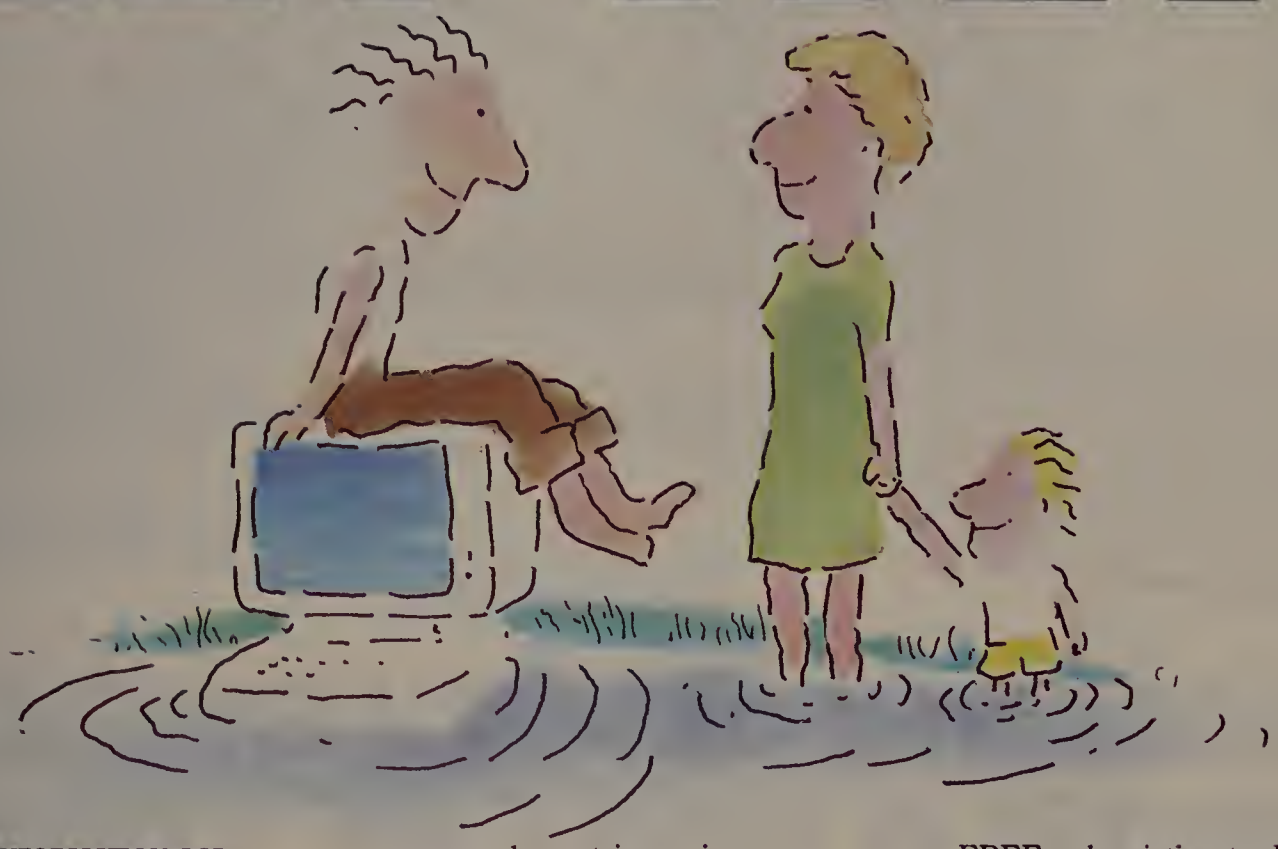

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Letters

Reactions and responses from the PC World community

Heartless, Heartless

I'm in the paradoxical position of taking issue with John Dvorak ["IBM Needs Heart," *PCW*, June 1985] even though I agree with what he says. He contends that IBM has been less than forthcoming in acknowledging its mistakes and imperfections, especially with the PCjr and the AT, and that a more open attitude would be better for both the company and the consumer. I agree, but why confine these comments to IBM? The "I-am-perfect" syndrome is universal.

When Apple admits that the Lisa was not an unqualified success, when Union Carbide admits that its safety measures in India were less than perfect, and when Reagan admits that perhaps he shouldn't have gone to Bitburg, then I'll revise my opinion.

Robert Gelman
Silver Spring, Maryland

No Laughing Matter

John Dvorak's comments on IBM in the June issue would have angered me had I not purchased a PC AT from an IBM Product Center. The unit's 20MB hard disk had 10K of bad sectors. I complained to an IBM representative who promised that despite the bad sectors, I'd "never have any problems with the disk."

After a format failure, IBM replaced the disk, and again 10K of bad sectors appeared. Several replacement hard disks, lost files, a system crash, and an abundance of bad sectors later, I once again filed a complaint with IBM. In return, I received a registered letter stating that I was jeopardizing future transactions with the company. The letter also contained this gem: "There exists no apparent reason to suspect that bytes in bad sectors will cause you any problems."

Mr. Dvorak is wrong when he implies that IBM lacks a sense of humor. The company has one–albeit a sick one.

Carlos Corredor
Sausalito, California

Sonic Debate

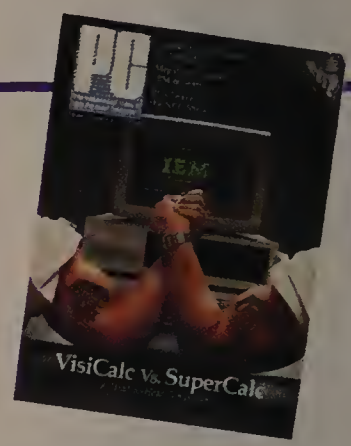
Keith Yates, the so-called certified audio consultant who wrote "Hi-Fi Floppy," [*PCW*, April 1985] seems to have been brainwashed by the people at CompuSonics.

Yates referred to the compact disc (CD) as a device that "makes a Steinway sound like a synthesizer." Have you ever listened to a CD play music that was originally recorded with a digital recorder? I've witnessed tests in which several "audiophiles" compared the original digital recording played on a Soundstream Digital Recorder to an analog tape (from which records are made) and a CD counterpart. Not one person could distinguish the difference between the CD and the digital recorder, but all agreed that due to tape hiss, distortion, and a lower dynamic range, the analog didn't measure up to the other two.

Operating at its lowest data transfer rate (160,000 bits per second), the DSP-1000 fills a 6.6MB floppy in 5½ minutes. Who wants to listen to music on a machine that requires changing floppies that often? A CD holds nearly 1 gigabyte of data, which is why optical memory is ideal for the vast amount of data storage that digital audio requires.

(continues)

Discover what 60,000



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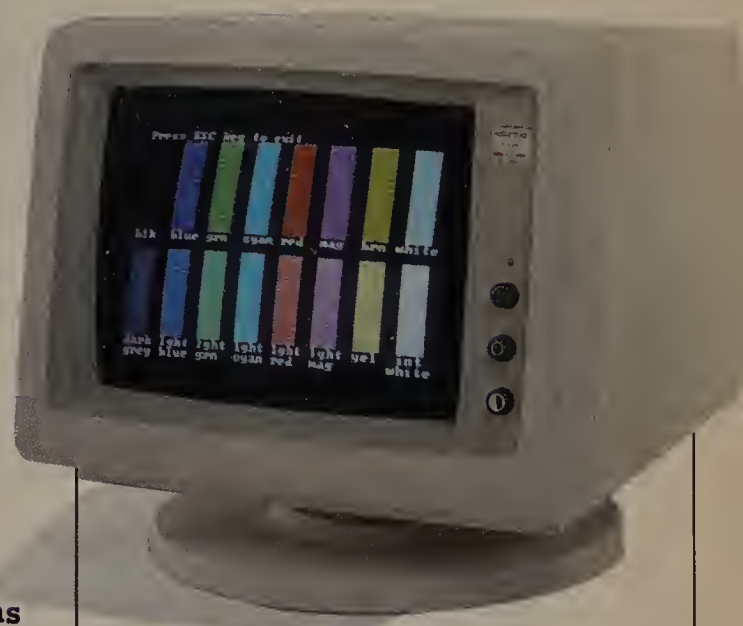

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Circle 907 on reader service card

As a five-year member of Soundstream's technical staff, I've seen a great deal of absolute nonsense published about digital audio. Claims have been made that digital audio will sap a person's strength or destroy an audio amplifier. It seems that even in the eighties, the industry is plagued by darkness, misunderstanding, and ignorance.

Dane Brewer
Midvale, Utah

CompuSonics indicated throughout the developmental phases of the DSP-1000 that the possible record and playback times with 6.6MB floppies are insufficient to make the product commercially viable. The firm is now using Maxell's new 25MB particle floppies. As the article indicated, the DSP-1000 technology may also be applied to any erasable storage medium—hard disk, bubble memory, or floppy disk.

The other factor governing record and playback time is the data rate, which in the DSP-1000 is determined by both the user and the nature of the signal. It is important to understand that CompuSonics uses a proprietary technology that, unlike other digital systems, deliberately discards redundant and perceptibly unretrievable musical information to obtain a 160,000-bps data rate compared to the CD's 1.4 million bps. CompuSonics is now experimenting with data rates significantly lower than 160,000 bps.

Readers interested in debating the performance of digital versus traditional analog recording technology should audition the best of both technologies—say, a Meridian MCD or Mission 7000 compact disc player and a Linn Sondek LP12 turntable—and draw their own conclusions. Based on my experience as an audio retailer, I suspect that few will dispute digital audio's tremendous potential and

(continues)

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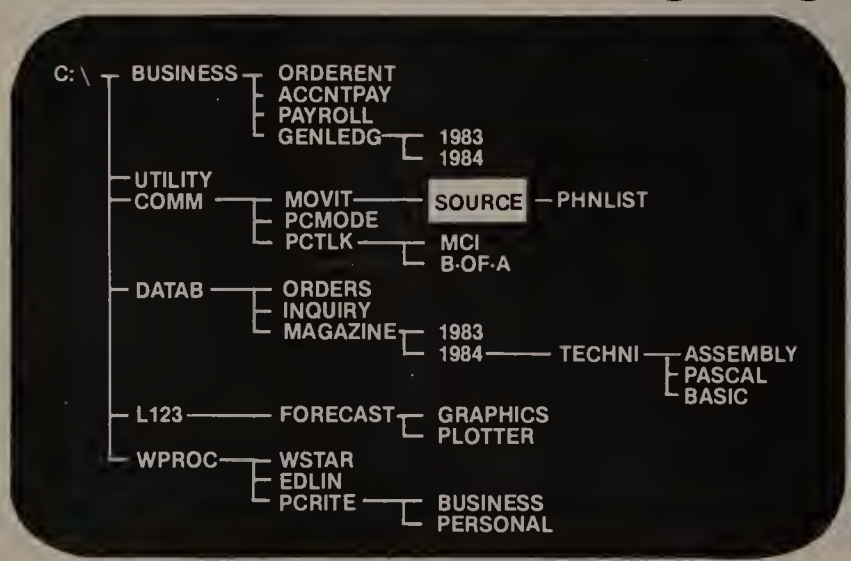

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"Helps enormously in waltzing through directory trees."
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—Gary Ray, ***PC Week***, 10/23/84.

". . . a standout" shell program. —Alan Hoenig, ***PC World***, 8/85.

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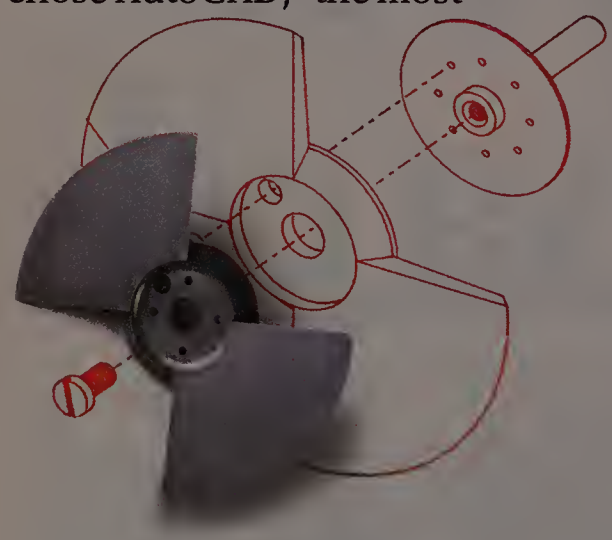

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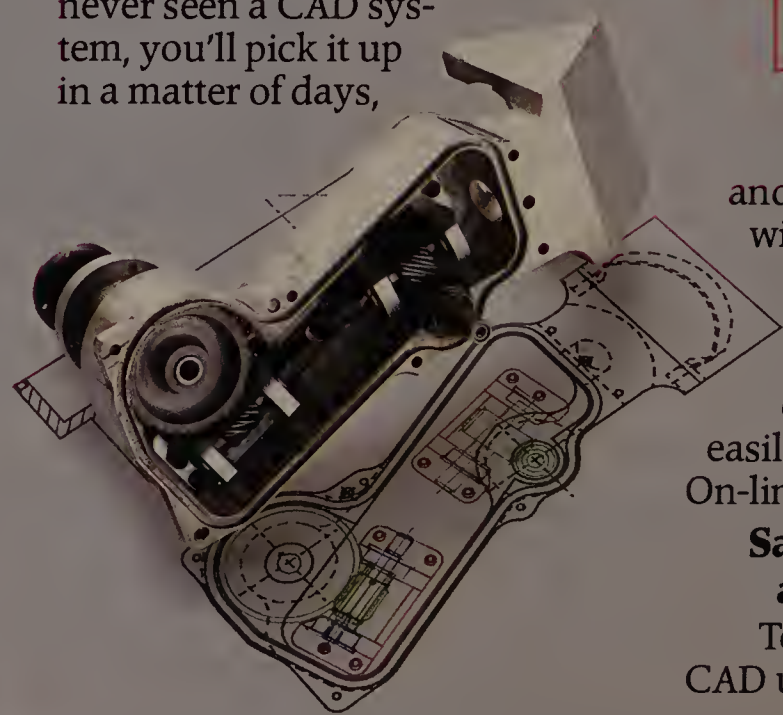

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Circle 701 on reader service card

its lower background noise, freedom from pitch wavering (wow and flutter), and user convenience.

The best analog systems still offer a slightly more natural, pleasing sound, but that will change as digital audio technology, now in its infancy, matures. –Keith Yates

Word Wars

While I thoroughly enjoy my subscription to your magazine, I must take issue with the "review" of *Samna Word III* by Merrily Shinyeda ["From the Software Shelf," *PCW*, April 1985].

If Ms. Shinyeda had had any experience at all with the program, I doubt that her review would have been so glowing. Anyone who has had to watch *Samna* endlessly scroll through a document while reformatting must wonder if a multitude of features is worth the wasted time. Every other review I've read of this program criticizes its sluggishness and its inefficient text editor, yet Ms. Shinyeda makes no mention of these shortcomings.

My experience has shown that *Microsoft Word* runs circles around *Samna Word III*. I have since traded the features offered by the Samna product for the speed, accuracy, and friendliness of *Word*.

Bruce W. Derr
Syracuse, New York

To each his or her own. My choice happens to be Samna Word III*–a product I've been using since its introduction. It not only is feature rich but provides a consistent user interface and the flexibility required to handle a wide variety of applications.*

The review is not meant to compare Samna Word III *with* Microsoft Word *or any other PC word*

(continues)

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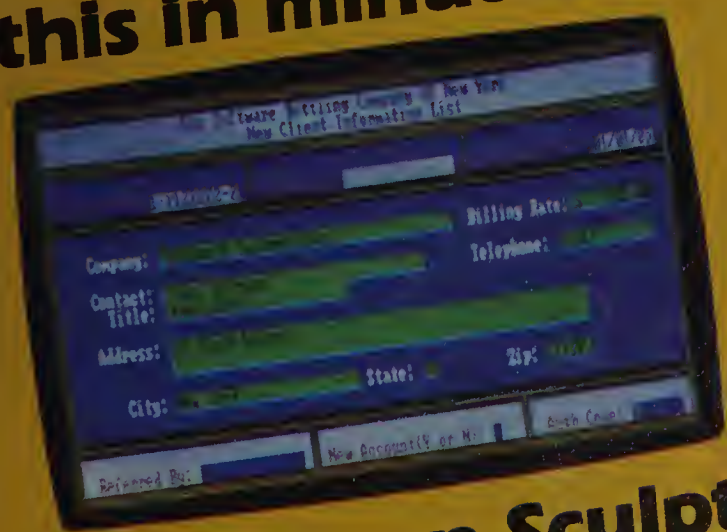

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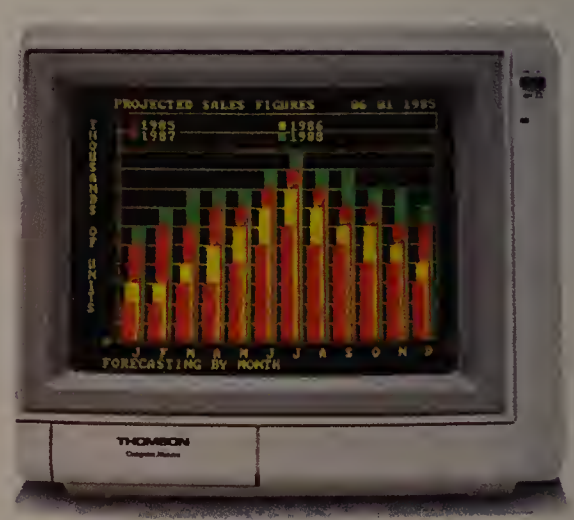

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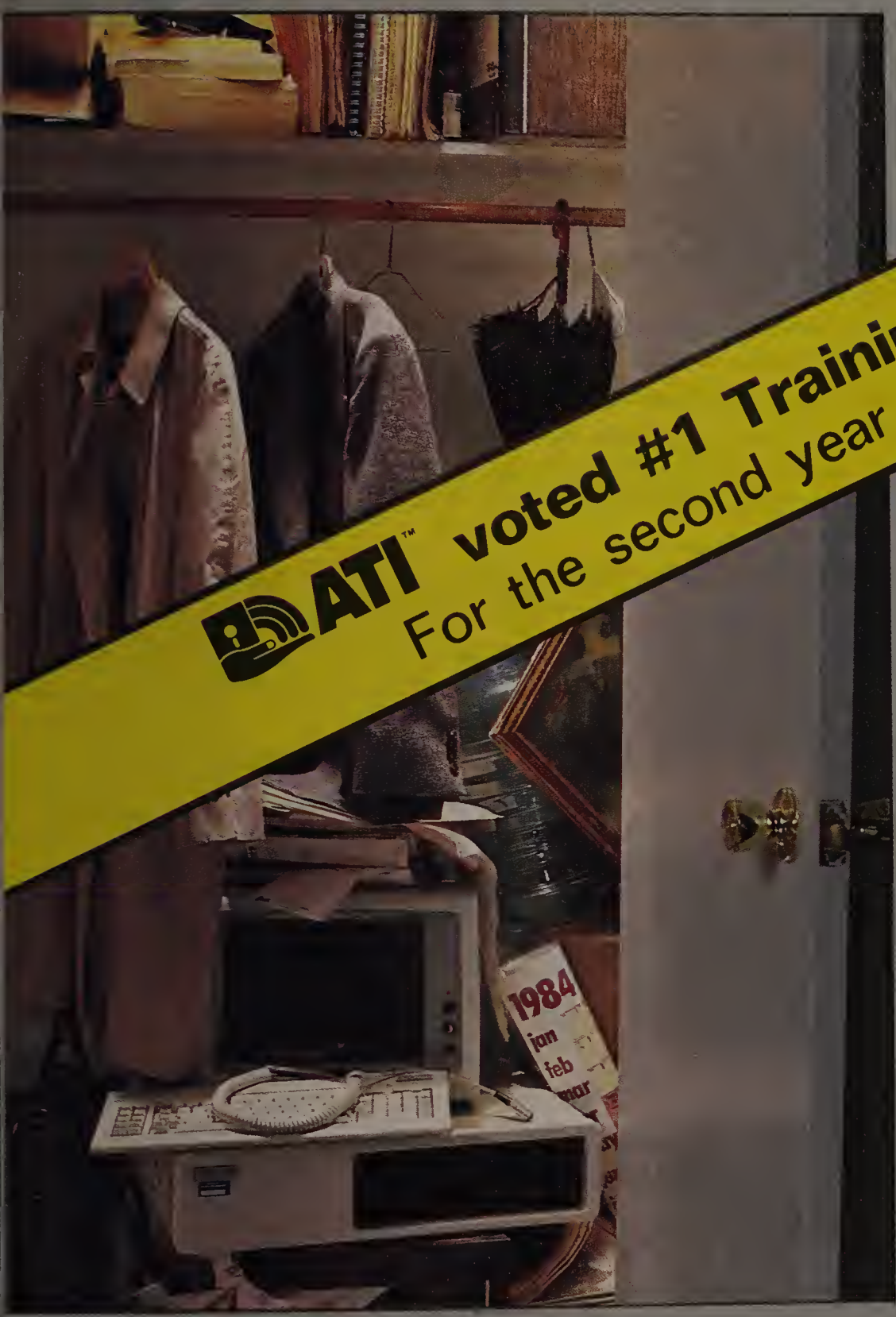

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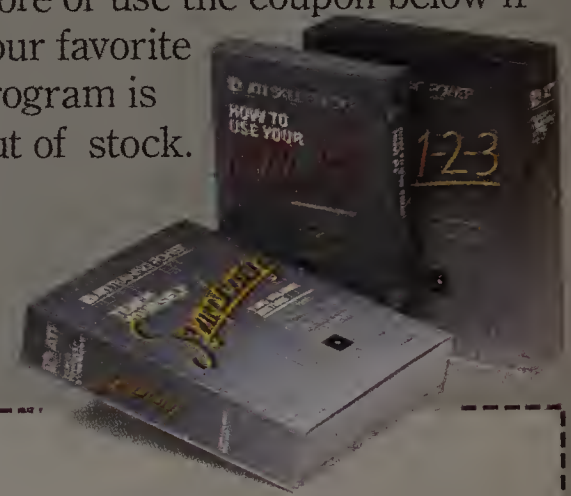

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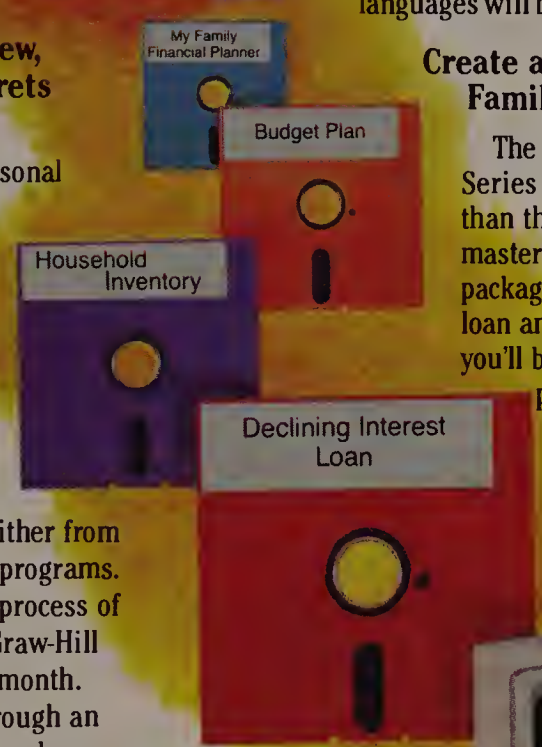

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3	Barton, Lily	32630	Marketing	323	C	24,000	M	07-Mar-81
4	Berquist, Carla	66211	Finance	662	B	34,700	S	06-Jun-82
5	Byer, Nicholas	66233	Finance	662	B	33,000	S	16-Aug-81
6	Carlson, Conrad	32753	Marketing	327	B	34,750	S	17-May-83
7	Custance, Edith	10106	Personnel	101	C	22,000	M	27-Jul-83
8	Estaban, Rachel	73222	Sales	732	A	34,750	S	06-Oct-83
9	Fishman, Laurette	49262	Operations	492	B	33,760	S	05-Dec-84
10	Gabor, Margot	66083	Finance	660	C	17,000	M	14-Feb-85
11	Gelman, Jacob	32799	Marketing	327	B	34,900	S	08-Apr-85
12	Hurley, Ariel	49273	Operations	492	C	23,500	S	25-Nov-84
13	Ikeda, Masa	10156	Personnel	101	B	33,550	S	07-Mar-81
14	Lane, Bonnie	73297	Sales	732	B	32,000	S	08-Aug-83
15	Lee, Kim	66094	Finance	660	C	16,500	M	16-Aug-81
16	Malouk, Fred	49266	Operations	492	B	33,200	S	17-May-83
17	May, Christopher	66093	Finance	662	B	29,000	S	06-Jun-84
18	Petrow, Cynthia	49266	Operations	492	B	38,500	S	25-Sep-84
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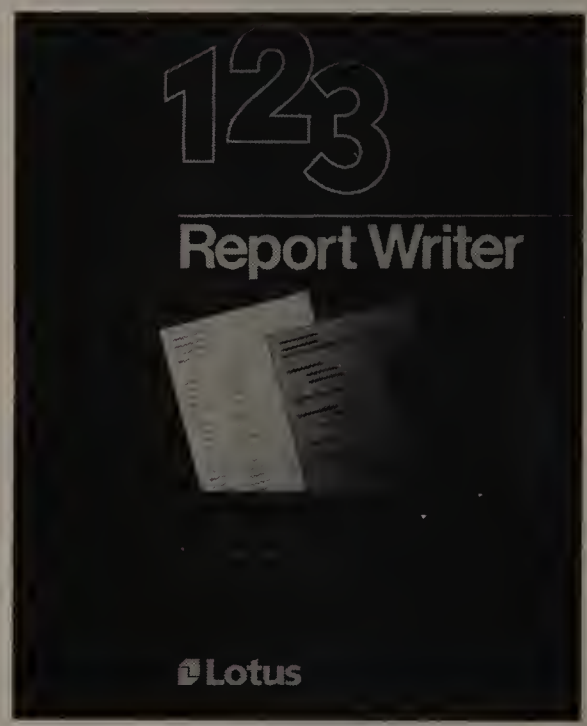

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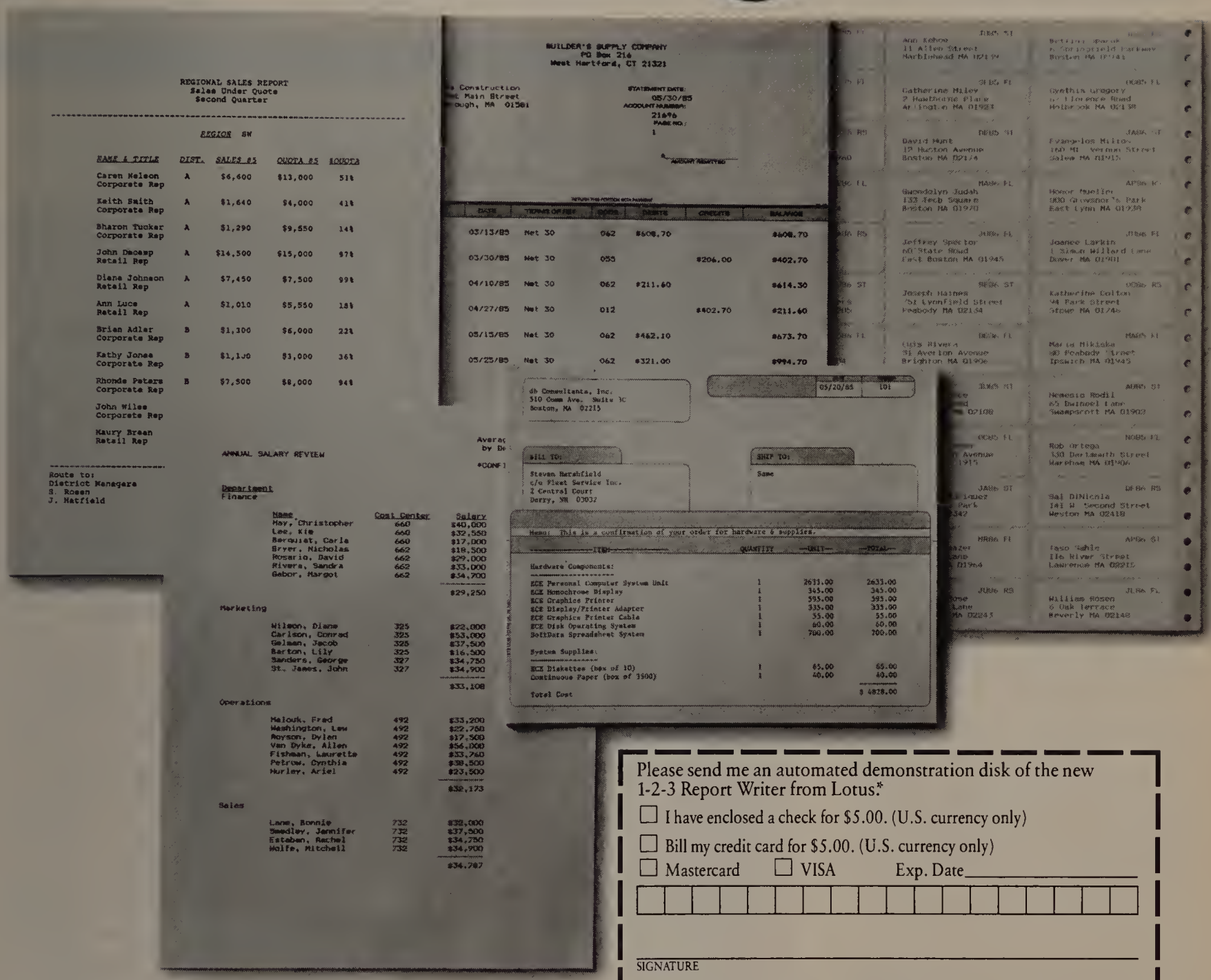

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PC WORLD

New Chips: In for the Kill?

Will a new generation of semiconductors sound a death knell for PC compatibility?

IBM may be ready to flex its muscles and try delivering a killer punch to manufacturers of compatible personal computers, according to one market watcher. A recent report by International Resource Development (IRD) of Norwalk, Connecticut, predicts IBM will develop its own custom, proprietary microprocessor chips—a move that IRD predicts will, because of its impact on industry standards, reverberate through the PC marketplace like a sonic boom.

PC World View *reports new developments in computer technology, items of interest to computer enthusiasts, and the most significant and enticing insights about industry trends and personalities. We've reserved the "Grapevine" section of this column for industry reports that are still at the speculative stage.*
—Ken Greenberg

Since IBM already owns manufacturing rights to a number of Intel chips, Big Blue could easily layer proprietary masks on top of a standard 8086 or even an 80286. IRD predicts that IBM, perhaps as early as next year, will introduce a KIL/AR (Kustom Integrated Logic/ARray) chip that includes a microprocessor, BIOS, instruction sets to simplify programming, and an operating system. The result would be proprietary machines much faster and more efficient than current offerings—thereby creating a new standard that would be difficult if not impossible to clone.

"It's not inconceivable that IBM will try to regain some control from the customer—control it had before the personal computer phenomenon—by taking a standard chip and twisting it a little," says Steven Weissman, an IRD analyst. Most other industry officials remain skeptical, however.

"I don't buy it," says Daniel Klesken, semiconductor analyst at Montgomery Securities in San Francisco. "Standard microprocessor chips will be key to personal computers because of the breadth of software written for them." For IBM to move away from the standard it created with the PC would mean abandoning customers' $7 billion investment in PC software, Klesken reasons.

"I think IBM would be cutting its throat if it did that," agrees Brian Halla, director of marketing for the microcomputer group at Intel Corporation. "Standards create the momentum in this business." Although IBM owns nearly a third of Intel, Halla insists the relationship is structured to make it impossible for his company to know in advance about any proprietary IBM chips based on Intel-standard CPUs.

Perhaps, says IRD's Weissman, IBM is simply looking for a new upwardly compatible machine with which to lock in its customers. The new box would be capable of running all current PC software but could also handle programs written expressly for the proprietary chip's operating system. In some ways such a machine would resemble the new Commodore 128, which boasts three

View

News and notes for the computing community

CPUs. That machine can run off-the-shelf software written for the earlier Commodore 64 and CP/M machines, but its new operating system enables the computer to perform far faster with specially written software.

A closer analogy may be IBM's new System/36 PC office computer. Though its System/36 System Support Program (SSP) operating system cannot run software written for the PC, the computer serves as the base station for up to three PCs, XTs, or ATs that can run their own software or serve as terminals for the System/36. The System/36 PC uses an open architecture hook–the standard PC–but offers enticements for the user to move up to the proprietary architecture of the System/36.

"The System/36 PC capability does not mean you take the PC itself and get rid of that architecture," argues Skip Bushee, executive vice president of InfoCorp, a market research firm based in San Jose, California. "I think that is extremely unlikely." *–John Eckhouse*

... Or Just for the Thrill?

In the words of a recent TV commercial hawking yet another panacea for yellow waxy buildup, it's "more better." More better than what? you say, reaching for an aspirin and Fowler's *Modern English Usage*.

Better than the PC's 8088, the Deskpro's 8086, and the AT's 80286, according to master chip maker Intel. The "it" that threatens to relegate these faithful data crunchers to the Home for Feeble CPUs is the 80386, a microprocessing *tour de force* that Intel claims can directly access 4 billion bytes of memory, manipulate 64 trillion bytes of virtual memory (usually disk storage), provide true multitasking and multiuser performance, and process data three times faster than the 80286.

Of course, the road to more powerful processing and multitasking has had its potholes. Students of recent history may recall that the 80286-based AT is not nearly the multiuser powerhouse that industry insiders predicted. Digital Research's publicized difficulties in unleashing the 80286's protected memory mode (vital for any useful multitasking operating system) have also raised questions about Intel's designs. What Intel promises and what the 80386 can deliver may be two different animals.

If the 80386 is everything Intel says it is, the computing world is indeed about to be knocked on its ear. The CMOS 32-bit chip contains nearly 300,000 transistors—double the number found in the 80286—and packs the equivalent power of a late 1970s mainframe. Its raw processing power alone is sufficient to keep pace with coming developments in high-speed memory, optical storage, and Ethernet networks. If you can't bear to part with *WordStar* or *1-2-3*, rest assured that your investment is safe. Because the 80386's design is essentially an extension of the 80286's architecture, the chip should run these and most other PC packages unaltered, Intel affirms.

Intel expects to release the new chip this fall. Although the specifics of an 80386-based PC are unknown at this point, such a machine should have the ability to orchestrate many tasks simultaneously, serve up to ten users, and at last transform PC-oriented expert systems into true desktop consultants. There's no telling what new and exciting shakeouts the 80386 may portend. When will this SuperPC hit the shelves? Only Intel and IBM know for sure.
—*Robert Luhn*

Say It Ain't So, Madame Mayor

Ah, politics. You're in one year, out the next.

In San Francisco, for example, computers seem to be distinctly déclassé this fall. As evidence, Mayor Dianne Feinstein recently garnered several column inches in *Business Week* as part of that journal's cover story on the computer industry's latest round of convulsions. "Why Feisty Feinstein Put Her Foot Down," read the headline. The item revealed that the mayor has "always been suspicious of the golden glow of high technology" and chronicled her recent clampdown on computer-related expenditures in the city's budget. "I wouldn't have one on my desk," proclaimed the mayor.

Faithful *PC World* readers may recall that Mayor Feinstein and her desk—which sported an IBM Portable PC—graced our August 1984 cover. Just for the record, as they say, we rummaged through

that issue, noting that a campaign aide using *dBASE II* on the PC shared a bit of the credit for Feinstein's reelection. In an item entitled "You Can Automate City Hall," the mayor herself offered these words: "I think that a sophisticated approach to microcomputing is important to San Francisco. The computer industry is and will continue to be a major job base for our people.... We in San Francisco are increasing computer-related training in our elementary and secondary schools, vocational centers, and community colleges."

So mea culpa: You *can't* automate city hall. Not this year, anyway.

LANs Ho!

Computers have drawn a tight-knit world even closer. Now, some of the luckier folk among us get to enjoy both a computer and the world.

A roomful of PCs is part of the "entertainment" package on the world's only five-star cruise ship, the *Queen Elizabeth II*, owned by Britain's Cunard Line. The *QE II*'s Computer Learning Centre was installed in time for her 1984 world cruise.

As much as this association with the upper crust has spruced up the PC's slightly gray image, Cunard is strictly a paying customer. "It was a seller's market in those days," recalls John Whitney, Cunard's New York marketing manager and the man who pushed the idea to fruition. "We went to a number of vendors, and some of our staff actually suggested Commodore 64s. I said, 'You just can't do that. Sure it's entertainment, but let's get the right equipment. This is a first-class ship.'"

Cunard bought six PCs initially and doubled that a year later, adding some XTs as well. Each station now includes an Epson printer or equivalent, and a score of programs lines one wall. Among those packages now at sea are *1-2-3*, *VisiCalc*, *Multiplan*, *WordStar*, *Electric Pencil*, *dBASE II*, and *dBASE III*. If the prospect of playing with a DBMS doesn't jibe with notions of what one is supposed to do on vacation, there are at least letters to write and travel diaries to keep.

The units are firmly secured to prevent sliding in bad weather (and to discourage sticky-fingered passengers). Closed from 2 to 6 a.m., the Centre is otherwise at the complete and free disposal of *QE II* guests. "I've seen people in tuxedos at 1 a.m. working there," Whitney says. "I don't think anybody expected it to be such a success. One round-the-world passenger wrote a complete novel during her three-month trip."

Whitney admits that the majority of passengers shove off as computer neophytes and eagerly sign up for the 1-hour introductory seminar that is offered twice daily. "The Centre provides a rare opportunity to get introduced to computers," he says. "People are not so embarrassed to try them at sea. They figure everybody else is a novice, too, and if they're lucky they'll never see any of these people again." *–Sally Adamson Taylor*

Grapevine

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Ruminating Over Nonsupport

Getting a line on IBM's next move is akin to fathoming cubist paintings, tea leaves, or the works of Martin Heidegger. Nonetheless, the company's recent quiet cessation of support for the UCSD p-System, a gaggle of games, and a raft of programs from Software Publishing and Peachtree Systems may portend big doings in Boca Raton.

Our first thought is that IBM is backing away from software that gives *TopView* seizures—an indication the company may intend to enshrine *TopView,* the lumbering window manager, as its Brave New Operating System. Our second thought is that the newly orphaned programs—some of which make direct calls to the hardware—may not mesh with IBM's current and future scenarios for the 80286 architecture embodied by the AT.

Withdrawing support means Big Blue stops product sales, discontinues customer assistance, and ceases guarantees of software compatibility. For vendors bumped off the list, it's back to burning the midnight oil in cozy cubicles until the code is cleaned up.

Big Blue's News

* * * * * * * * * * * * * * * * * *

Desktop Derby

By mating its System/36 with the PC line, IBM has bred another foal for its stable of office automation products. Christened the System/36 PC, the hybrid unit consists of a PC attached by cable to the S/36 5364 desktop processor. This umbilical arrangement allows a PC, an XT, or an AT to serve alternately as a system console, a System/36 workstation, or a standalone PC. Three additional stations, either PCs, printers, or System/36 displays, can be added to the system.

Even though IBM refers to the 5364 processor as an "entry-level System/36," there's no doubt Big Blue expects the newcomer to keep pace with the rest of the pack. The 5364 runs a full-blown version of the SSP and uses a special microcode that works with DOS to ensure PC-to-S/36 communications. A PC workstation can flip between S/36 and PC modes, so the 5364 processor runs S/36 programs while the workstation runs PC applications.

A slightly trimmed-down version of its larger brothers, the 5364 contains 256K of System/36 main storage and a single 5¼-inch 1.2MB disk drive. A 40MB 5¼-inch hard disk is standard, with another 40MB disk available as an option. The 5364 will communicate with other System/36 processors and can access the host of System/36 software now on the market. A utility program from IBM converts System/36 data and applications programs from the 8-inch disks to 5¼-inch format.

IBM offers the 5364 processor with 256K and a 40MB hard disk for $5995. With 80MB of hard disk storage, the price is $8090. The PC is priced separately.

Just how well the System/36 PC fits in with its stablemates has yet to be seen, but the Big Blue herd continues to gallop along in the office automation sweepstakes.
—Wes Nihei

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Two In One

TopView has been criticized for its speed-impeding girth. It appears now that *TopView*'s pudginess isn't baby fat; it's a proprietary, IBM-written operating system, buried within the code—fresh evidence of Big Blue's striking out on its own, perhaps. On the other hand, this avoirdupois may simply be a hard-to-remove vestige of the unique but unwieldy development language used to create *TopView.*

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Go East Young Jr

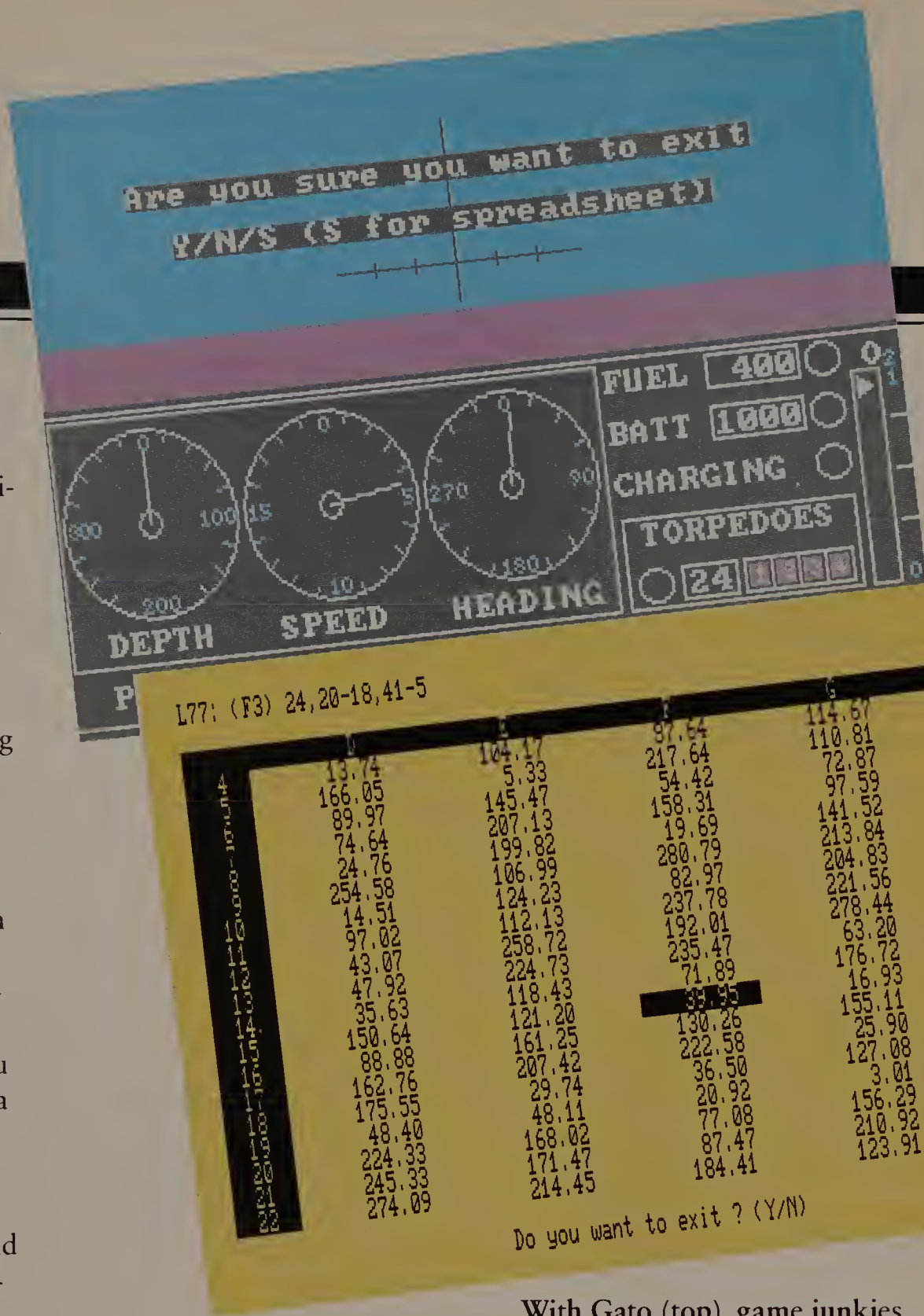
Remember PCjr? Seems that Jr lives, at least in the Far East. IBM Japan is reportedly developing a PCjr version of the IBM 5550—a Japanese-built PC that sports 3½-inch disk drives. This retooled Jr is expected to be compatible with both the IBM 5550 and the garden variety PC. Never say *sayonara.*

When in Doubt, Dive

All you inveterate game players out there know the feeling too well. You're approaching the Critical Moment, the penultimate point in your favorite guilty pleasure, when Mr. Big strides into your cubicle, shattering your concentration, your composure, and your credibility as a crackerjack cog in the corporate cause. The jig is up, and your midday *Run for the Money* excursion is kaput.

Well, tremble no more. If your game of choice is *Gato,* a submarine simulation from Spectrum Holobyte, help–in the form of a dummy spreadsheet–is but a keystroke away. When your supervisor appears to be closing in, you can submerge your game behind a meaningless matrix–and even do away with those distinctly unprofessional squawks and beeps.

Since no one at *PC World* would even think of playing a game during business hours, this little wrinkle–known generically (and for obvious reasons) as a "boss switch"–was brought to our attention by an irate reader. He lamented this "new form of white collar crime" and took umbrage at "the unethical practice of using company time to play games."



With Gato (top), game junkies can obtain instant relief from unannounced visits by the boss; at the touch of a key, it's back to business (and a curiously static spreadsheet).

Patricia Herringer, product manager for Spectrum Holobyte, prefers a more lighthearted interpretation. "It's really just a novelty. Some business owners have written us in mock upset, but mostly, people think it's hysterical." Still, Spectrum Holobyte is discreet; the *Gato* documentation is silent on the spreadsheet switcheroo.

The AT's True Blue Collar

Never let it be said that IBM is afraid to get its hands dirty.

Big Blue continues to extend its reach from the upstairs office to the factory floor by significantly expanding its PC-based vertical market offerings. Coming on the heels of the Professional Graphics Adapter/Monitor–a potent tool for engineers, scientists, and industrial designers–and the 5531 Industrial Computer (a variation of the XT), IBM's newest releases confirm the company's interest in tailoring the PC to the job site.

IBM devised the 7531 and 7532 Industrial Computers by drafting the PC AT from the desk top and dressing it in the armor necessary to endure the harsh environs of the manufacturing workplace. To ensure maximum endurance on unfriendly turf, the 80286-based machines contain removable filters to collect dust and other particles, plus cooling fans to protect the power supply and system unit components. The keyboard is shielded with a plastic membrane, and the disk drives are guarded by a keylocked door. Expansion boards are secured by a retainer bar, which also cushions them against shock and vibration.

The 7531 and its rack-mountable counterpart, the 7532, are otherwise outfitted with 512K of RAM expandable to 3MB, a high-capacity 1.2MB floppy disk drive, a clock/calendar with battery backup, seven expansion slots, and ROM-based BASIC. Up to 40MB of hard disk storage is available by installing two optional 20MB drives.

Not one to miss a marketing opportunity, IBM has recognized a demand in the manufacturing sector for a machine with the AT's capabilities. "We believe there's a present and future need for an AT-type machine on the factory floor," says IBM spokesperson Michael Dutton. "This machine is intended for a wide variety of applications that require a PC controller unit on the plant floor–mechanized assembly control, quality control, computer-aided manufacturing management, tool maintenance, preventive maintenance, machine monitoring, and other information-gathering and processing tasks associated with manufacturing."

Although the AT is Entry Systems Division's baby, these industrial-strength machines were produced by Manufacturing Systems Division, an independent business unit charged with developing products for the manufacturing environment. Accompanying the introduction of the 7531/7532 Industrial Computers was a raft of software for the machines, including products from Allen-Bradley and Gould-Modicon, two established factory computer products vendors.

Fueled in part by increasing interest in vertical applications, the AT has caught on–whatever the color of its collar. –*Wes Nihei*

John Eckhouse is a business correspondent for the San Francisco Chronicle. *Sally Adamson Taylor is a freelancer based in Hong Kong.*

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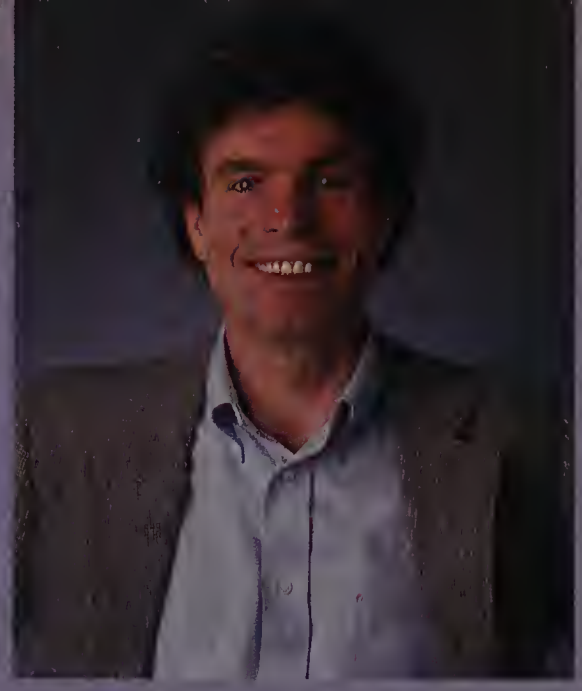

David Rose, inventor of ProKey.

Spend 2 minutes learning how to add a powerhouse of function to your keyboard with a terrific new version of ProKey!

"Suddenly others have discovered what RoseSoft has known since we invented the ProKey concept. If your keyboard could work a whole lot harder, your life would be a whole lot easier.

The original idea behind ProKey was a program that would let you store strings of keystrokes you could recall at a touch. Now there's ProKey 4.0 and it's better than ever."

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Want to log onto Dow Jones with your communications package to check on how your IBM stock is doing? Just type the keyword you previously selected for this function, "IBM". Need to print a profit and loss statement? Typing "p&l" is all it takes.

Behind the scenes, ProKey 4.0 checks its memory for the string of commands required to carry out the task and executes them automatically. Forgotten what functions you have available? Just call up the built-in menu that describes them in plain English.

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Built-in editing, English language menus, multi-character macro names and the ability to instantly change sets of functions. These are just four of the exciting new features that make ProKey 4.0 the most powerful macro processor you can buy."

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The hostess of a lavish masquerade ball has just been brutally strangled.

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Just slip SUSPECT,™ Infocom's latest interactive mystery story, into your computer and suddenly you are a newspaper reporter covering the blue-blood society event of the year, Veronica Ashcroft's annual Halloween costume ball. And every decision you make will determine the story's suspenseful outcome. Suppose, for instance, that while snooping about the mansion in your cowboy costume you decide to peek in the office. You simply type, in plain English:

```
>OPEN THE DOOR
THEN ENTER
THE OFFICE
```

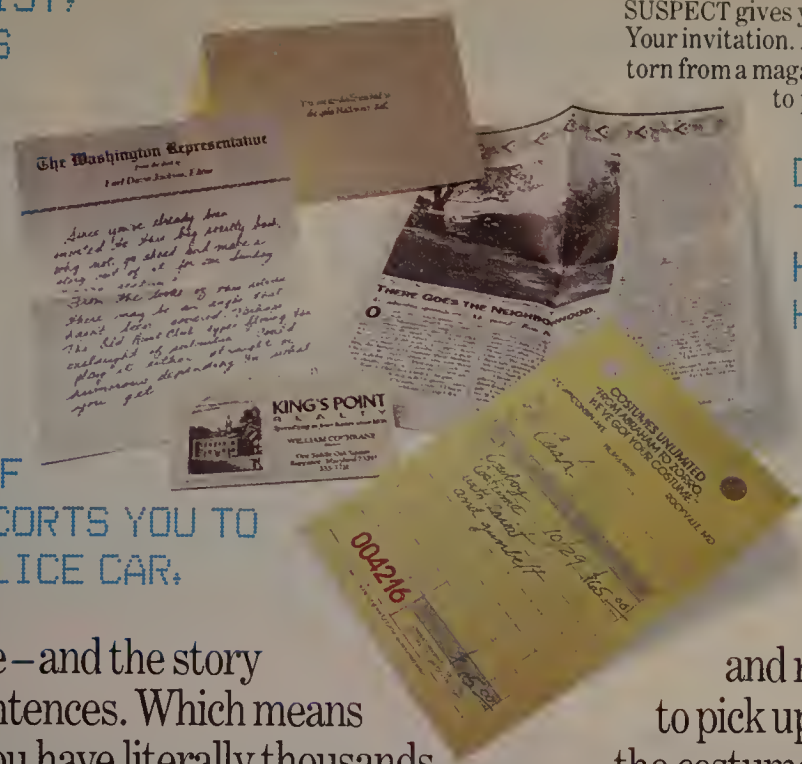
And the story responds:

```
YOU OPEN THE DOOR.
SLUMPED BEHIND THE
DESK IS THE BODY OF VERONICA
ASHCROFT. HER MASK HAS BEEN
PULLED OFF. AROUND HER NECK
IS THE AGENT OF DEATH, A
ROPE. IN FACT, IT'S YOUR
LARIAT, WHICH
YOU GOT TIRED
OF CARRYING
AROUND AND HUNG
IN THE CLOSET WITH
YOUR COAT.
```

You've been framed. And you have mere hours to discover who the real killer was. Because if you don't, you could be in serious trouble:

```
THE DETECTIVE GRABS YOU
FIRMLY BY THE WRIST, AND WITH
```

A PRACTICED TWIST, SLIPS THE CUFFS ON YOU. "YOU'RE UNDER ARREST FOR THE MURDER OF VERONICA ASHCROFT." SERGEANT DUFFY APPEARS AS THOUGH OUT OF NOWHERE AND ESCORTS YOU TO THE WAITING POLICE CAR.



SUSPECT gives you clues even before you flip on your trusty computer. Your invitation. A cryptic note on the back of a business card. An article torn from a magazine. A receipt for your rented costume. Even a guide to proper etiquette during a murder.

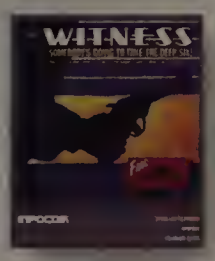
You communicate – and the story responds – in full sentences. Which means that at every turn you have literally thousands of alternatives. So if you decide it might be worthwhile, for example, to dance with Mrs. Ashcroft's corpse, you just say so:

>DANCE WITH VERONICA'S BODY

And the story responds:

YOU'LL HAVE TO LEAD, YOU CAN BE SURE OF THAT.

This masquerade ball is one bash where you'd better go easy at the bar. Because simply staying out of the slammer is a challenge that could send the soberest soul staggering.



Other interactive mystery stories from Infocom include The WITNESS,™ a 1930's style whodunit thriller in which a case of blackmail turns into murder before your eyes. And DEADLINE,™ which gives you just twelve hours to find the murderer, before he finds you.

You'll have to solve puzzle after puzzle as you build your case. You'll search for clues. Analyze evidence. Overhear conversations. You'll even question suspects:

>COCHRANE, TELL ME ABOUT SAMUEL OSTMANN

And the story responds:

COCHRANE IS UNSTEADY AND SWALLOWS A LITTLE MORE OF HIS DRINK BEFORE ANSWERING. "THAT SLIME! HE'LL GET WHAT'S COMING TO HIM ONE OF THESE DAYS. HE'S GOT AN IN WITH THE REAL ESTATE BOARD AND HE'S TIGHT WITH VERONICA. HE'S RUINING MY BUSINESS!"

And if you're clever enough, then maybe, just maybe, you'll prove your own innocence. But you'll have to hurry.

So polish up your party manners and rush down to your local software store to pick up a SUSPECT today. And remember, the costume ball lasts from 8 to 12. But if you don't solve the mystery, you'll soon be doing 18 to 20. With no parole.

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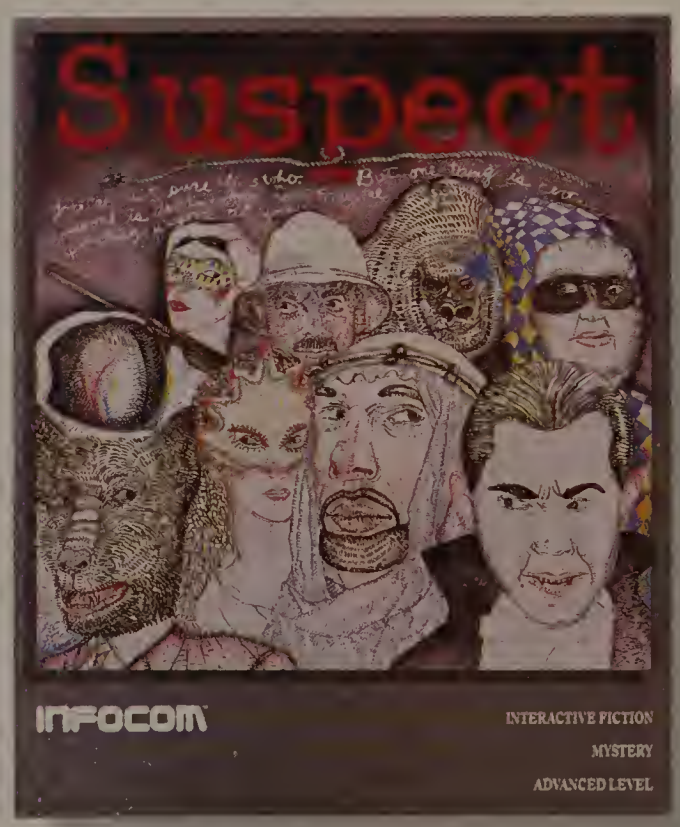

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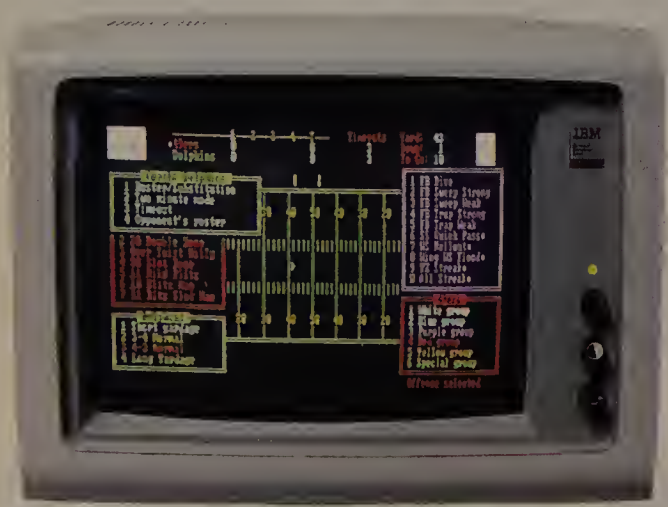

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The Help Screen

PC World offers answers and advice at every level

This month we discuss CONFIG.SYS, the DOS configuration file, and learn how to find our way batch backwards.

Karl Koessel

CONFIG.SYS: The DOS Configuration File

Q. Recently I installed an integrated software program on the office computer, an IBM PC with an external hard disk. Everything worked fine, but the next time I turned on the computer, I couldn't access the hard disk. A colleague, who had originally installed the hard disk, took a look and told me that my CONFIG.SYS file had been changed. Then I realized what had happened. The integrated program's installation instructions said that to take full advantage of a 640K system, I should copy the software manufacturer's CONFIG.SYS file onto the hard disk. According to my colleague, that version replaced the original CONFIG.SYS file and made the hard disk inoperative.

My colleague has finally reinstalled the hard disk, and I'm now working on the integrated package, but without taking advantage of all my system's memory. What exactly happened? Why didn't the installation manual warn me about potential problems? How can I access the rest of my PC's memory now without erasing my CONFIG.SYS file?

George Carney
Kansas City, Missouri

A. When you instruct DOS to copy a file from one disk or directory to another and the name you give the copy matches the name of another file on the target disk or directory, the copy will replace the identically named file. (If you do not specify the name for the copy, it will be given the same name as the original.) In your case, as your colleague has pointed out, the integrated software's CONFIG.SYS file replaced the hard disk's CONFIG.SYS file.

When you start DOS (2.00 or a later version), it automatically looks for a CONFIG.SYS file in the root directory of the disk from which it was started. The CONFIG.SYS file is used to augment the default DOS configuration. Commands within the CONFIG.SYS file control a variety of system functions. They define the situations in which DOS should check for a <Ctrl>-<Break> interrupt, specify the number of disk buffers, and choose date and time formats. Other commands install device drivers so that DOS can use "nonstandard" peripherals (such as mice, graphics tablets, and some hard disks), or replace the default device drivers so that standard input, output, printer, floppy disk drive, hard disk drive, and clock functions may be extended.

In CONFIG.SYS you can also set the last drive letter that DOS can use, identify the file name and location of a command processor to replace COMMAND.COM, and specify the maximum number of file control blocks and file handles that DOS can concurrently open (two methods used by applications to create, open, read, and write to files). More information on the DOS configuration commands can be found in the "Configuring Your System" chapter of the DOS manual.

In your case, the original CONFIG.SYS file contained a command specifying the file name of the driver for the hard disk. The integrated program's CONFIG.SYS file did not contain this command, so the hard disk was no longer available. The new CONFIG.SYS file probably con-

(continues)

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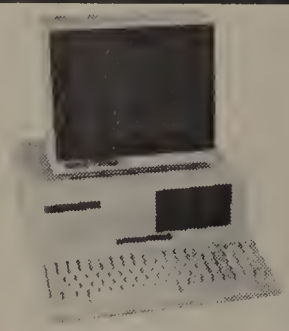

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tains buffer and file configuration commands that increase the default number of buffers and file handles. Because your PC has plenty of memory, you can afford to dedicate some RAM to an augmented system configuration that speeds up the integrated program's operations. What you need is a CONFIG.SYS file that contains the commands for both the hard disk and the integrated program.

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Why didn't the installation instructions warn you about copying the company's CONFIG.SYS file over an existing CONFIG.SYS

(continues)

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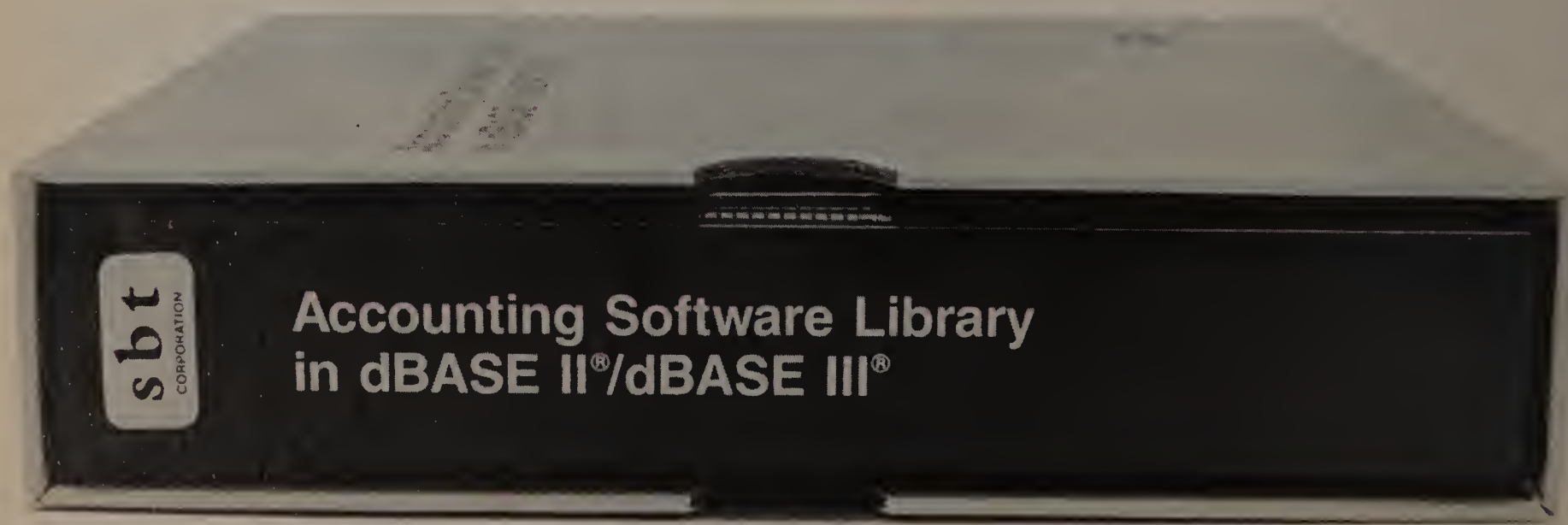

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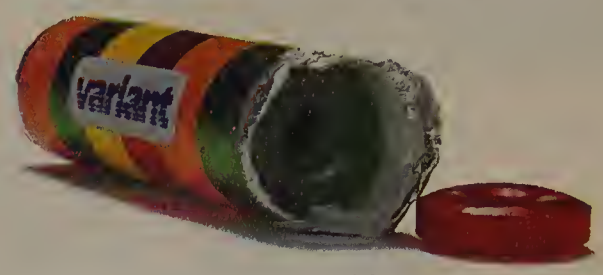

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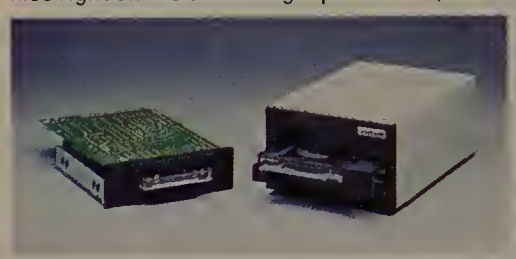

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file? Simple inexperience is my guess. Send the manufacturer a copy of your question and this answer—the company will appreciate it.

Batching Back to a Previous Directory

Q. We've been using batch files quite extensively as menu selections for specific application software. For example, Lotus's 1-2-3 *is in a separate subdirectory, and a batch file (LOTUS.BAT) automatically switches to that subdirectory, prompts the user to place the system disk in drive A:, and loads LOTUS.COM. When LOTUS-.COM finishes, the batch file returns the user to the root directory and displays the main menu. We have 12 subdirectories at the present time.*

Since not all of our users are DOS wizards, we have also developed a series of help screens for the DOS commands using the HELP.BAT routines published in your magazine [see "Cooking Up a Batch File," PCW, *May 1985, and "A Batch of Help,"* *.*, PCW, *Vol. 2, No. 12].*

Here's the problem. Our help screens are kept in their own subdirectory just like the other software applications. To execute the IF EXIST %1.HLP ... batch command, which tests for the existence

(continues)

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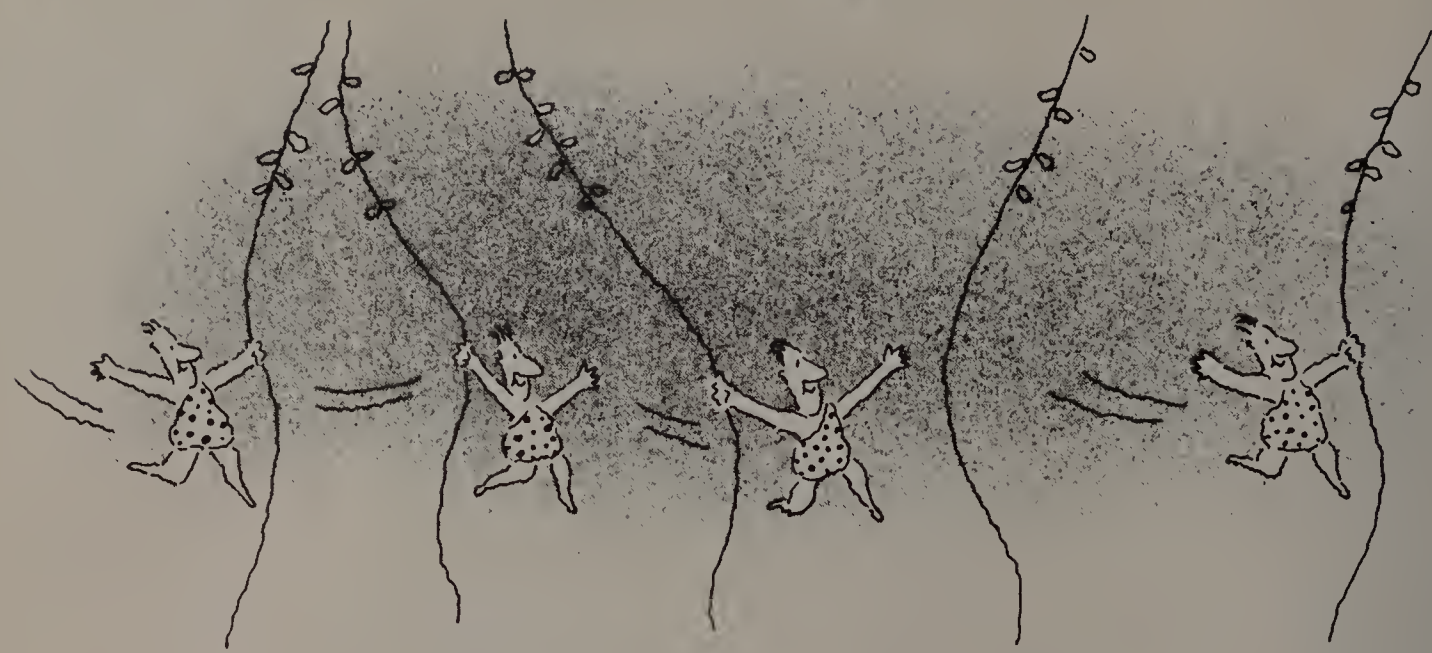

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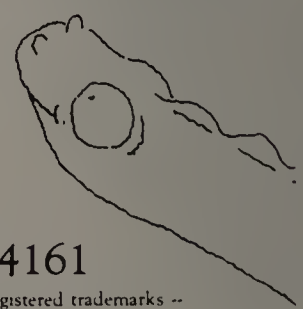

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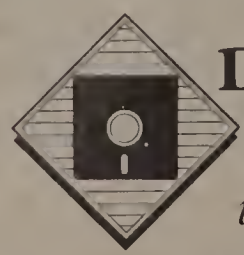

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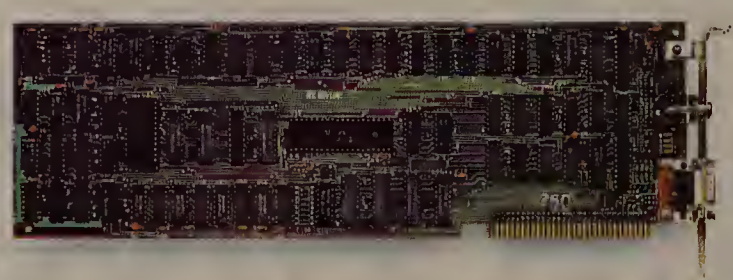

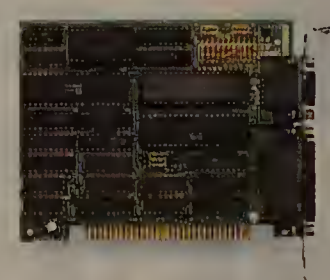

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of a specified help file, you must be in the directory where the help screens are located. To get HELP.BAT to work you have to change to the HELP subdirectory. In creating the batch file, our only alternatives were to leave users in the HELP subdirectory or return them to the root and the main menu.

The question is, how do we get users back to the subdirectory where they were originally working? As far as I can tell, there is no way to get DOS to remember where it came from when HELP.BAT was invoked. Having separate HELP screens and batch files in each subdirectory wastes space and destroys much of the elegance of this system.

Robert R. Stone
Schodack Landing, New York

A. DOS 3.00 and later versions accept paths in the IF EXIST command, so you don't have to leave the current directory to test whether a file exists in another directory.

For DOS 2.00 and 2.10, output redirection and BASIC can get the user back to the directory from which HELP.BAT was called. Modify HELP.BAT as follows:

```
echo off
cls
cd > c:\help\original.dir
cd c:\help
if exist c:%1.hlp goto does
if x= =%1x goto help
echo Sorry. Help unavailable for %1
goto end
:does
type c:%1.hlp
goto end
:help
type c:help.hlp
:end
pause
basica c:reset_cd
```

There are three basic differences between this HELP.BAT and the one you are currently using. The line 'cd >c:\help\original.dir' redirects the output of this CD command (display current directory) into a file named ORIGINAL-.DIR. The drive designator C: has been prefixed to the file names in HELP.BAT so that those files are found even when C: is not the default drive. And the new batch file ending, 'basica c:reset_cd', returns the user to the directory that was current when HELP.BAT was called.

Load BASIC or BASICA and create RESET_CD.BAS:

```
10 OPEN "C:ORIGINAL.DIR" FOR INPUT
   AS #1
20 INPUT#1, A$
30 CHDIR A$
40 SYSTEM
```

Use the command **SAVE "C:\HELP\RESET_CD"** to save this BASIC program in the HELP subdirectory on drive C:. This program reads the name of the user's original subdirectory from the file ORIGINAL.DIR (lines 10 and 20), changes to that directory (line 30), and exits to DOS (line 40).

This routine assumes that BASICA and HELP.BAT are available via the extended directory search path defined by the latest PATH command. For example, with HELP.BAT in a directory called BATCH and BASICA in a directory called DOS, your hard disk's AUTOEXEC.BAT file might contain the command 'PATH=C:\BATCH; C:\DOS;' so that the commands in those directories are available from any directory (see "Directory Assistance," *PCW*, August 1985).

Do you have any questions concerning the IBM PC or compatibles? Send them to The Help Screen, PC World, *555 De Haro St., San Francisco, CA 94107, or electronically to CompuServe 74055,412 or The Source STE908.*

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The Cookie Cutter

Planning every step in the manufacturing process and constantly monitoring the implementation of those plans is crucial to the success of any manufacturing business. A worksheet model not only keeps track of the production line—it also gives you control over such critical items as inventory, yield, and expenses.

Ron Feldman

Manufacturing is the sometimes tortuous, always intricate art of transforming raw materials into finished goods. The principles of production apply to anything you're making. Whether your finished work is a chocolate chip cookie or a silicon chip, only the sophistication of the product itself changes. Whether you start with a pinch of flour or a grain of sand, your ingredients inevitably pass through a series of manufacturing stages, yielding products that are offered for sale and, ultimately, shipped to customers.

Keeping the production flow smooth is essential to efficient manufacturing. It not only satisfies your customers by enabling you to ship products on schedule, it also provides the key to keeping costs down; you can optimize the use of materials, equipment, and labor while maintaining inventories at desired levels. The net result, of course, should be higher profits.

Although a PC may not be directly involved in manufacturing, the computer can be used to monitor production and inventories, to prevent delays and other problems, and to plan for changes in operations. This article presents a *1-2-3* worksheet, Cookie Cutter, that you can customize to meet your manufacturing needs. Working through the example will provide a clear idea of how *1-2-3* can be used to model and monitor any process. The tutorial assumes that you are familiar enough with *1-2-3* to move around the worksheet, format cells, enter formulas, and so on. Consult the *1-2-3* manual for assistance if you need it.

Cookie Cutter can easily be adapted for nonmanufacturing businesses, such as warehouses and retail stores, that track inventory and work flow; it also functions in paperwork-intensive operations like insurance companies and banks.

Chip Off the Old Cookie

The manufacturing flow presented in our worksheet is a simplified model of chocolate chip cookie production. It was adapted from a more complex model used in my business, the manufacture of integrated circuits. The computer chip model is much larger than Cookie Cutter because of the many manufacturing steps that must be monitored.

In adapting this model to your needs, begin by listing all the steps in your manufacturing process or work flow. Think of each step as a bucket: Units are dumped into it, something is done to them, and the results are poured into the next bucket. In the case of our chocolate chip cookie model, the major activities are making dough, cutting cookies, baking, packaging, counting, and shipping. Throughout this process, two primary types of information need monitoring: *activities* and *inventory*.

Essential information about activities includes the number of units processed in each step—how many go in and how many come out—as well as when transfer takes place.

Monitoring inventory requires tracking the units as they move through the process, particularly at work-in-process (WIP) steps (in which case they'll keep moving through the process) or static inventory steps (where they will stay until you send them on to the next step).

You also need to decide whether the worksheet will represent the monitoring of only one product or a variety of products. If you were a tire retailer, for example, you might divide your work flow into ordering, warehousing, and selling. You would then have to decide whether the worksheet would represent your entire stock, a specific make and model of tire, or something in-between, such as all tires made by a particular manufacturer, all tires of a certain size, or all tires for certain types of cars.

However you structure your manufacturing flow, this worksheet functions as if you were dealing in only one type of commodity; interpreting the data when that is not the case (as it rarely is) remains your managerial duty.

Building the Worksheet

For the purposes of this worksheet, the cookie-making process was divided into a six-step model.

Dough Making. Flour, sugar, milk, butter, chips, and other delectables are blended into cookie dough.

Cutting. Pounds of dough are formed and shaped into individual cookies.

Baking. In this "assembly" phase of the process, the cookies assume their final form.

Packaging. Baked cookies are inspected and wrapped for shipping.

Counting. Packaged cookies are counted immediately prior to shipping.

Shipping. The delicious morsels set off to see the world.

Four of these steps were divided into subordinate stages, explained in the cell-by-cell discussion of the worksheet that follows.

In setting up the worksheet, first enter its title in cell C1 (see Figure 1). As long as cells to the right of C1 remain blank, this title can be wider than the column. You can also include the current date, which you may have entered at the DOS date prompt before invoking *1-2-3*. You can insert the system date in your worksheet automatically by entering @TODAY, in cell B1 for example, and formatting that cell by moving the cursor to cell B1 and typing */Range Format Date 2* **<Enter>** **<Enter>**. (The sample worksheet here displays only a keyed-in month as the date.)

Each manufacturing step in this worksheet is slightly different, illustrating some possible variations.

The time periods for which you want to display plan activities and measure manufacturing performance run down the left side of the worksheet (column A). In this case, performance is tracked weekly; each Work Week's *planned activities* have a label (Plan 1 in cell A7, Plan 2 in A10, and so on). Those designations can refer to any time periods, so you needn't be confined to weeks; months, days, or hours work just fine.

Immediately below each Plan row is a row in which to enter *actual* data as it becomes available (Actual 1 in cell A8, Actual 2 in A11, and so on). The

	-A-	-B-	-C-	-D-	-E-	-F-	-G-	-H-	-I-	-J-	-K-	-L-	-M-	-N-	-O-
1		July	Cookie Cutter												
2		|-------DOUGH MAKING-------|			|----------CUTTING----------|			|----------BAKING----------|			|----PACKAGING----|		|-COUNTING-|SHIPPING	
3	Work Week	Lbs.	WIP	Lbs. |	Dough	Lbs.	Cookies	Cookies |	Unbaked	Cookies	WIP |	Unpacked	Packed |	Inventory	Shipped	
4		In	(mix)	Out |	(lbs.)	In	Cut*	per Lb. |	Cookies*	In*	(baking)*|	Cookies*	Cookies*|	OHE*	Cookies*	
5	PrevPlan 4	100	90	80	80	80	16	200	12	10	10	9	7	5	2
6															
7	Plan 1	100	90	80	80	80	12	150	9	15	14	9	7	9	3
8	Actual 1	100	100	70	70	80	13	163	15	10	10	9	7	9	3
9															
10	Plan 2	100	90	80	80	80	16	200	15	10	10	14	7	13	4
11	Actual 2	100	90	90	90	70	12	171	18	10	10	9	7	14	2
12															
13	Plan 3	100	90	80	80	80	10	130	16	10	10	9	11	21	2
14	Actual 3	100	90	80	80	90	11	122	14	15	12	8	9	20	3
15															
16	Plan 4	100	90	80	80	80	16	200	22	10	10	9	7	27	2
17	Actual 4	100	90	80	80	80	16	200	20	10	10	11	8	26	2
18															
19	Plan mtd	400		320		320	54	170		45			32		11
20	Actual mtd	400		320		320	52	163		45			31		10
21	Plan m	400	90	320	80	320	54	170	22	45	10	9	32	27	11

*In thousands

Figure 1: The Cookie Cutter manufacturing plan, showing both Plan and Actual data for all four weeks in July. The worksheet is designed so that production flow moves from the upper left to the lower right.

model requires a record of previous activities (whether actual or planned) from another worksheet, in this case the previous month's Work Week 4 (PrevPlan 4 in cell A5). The three summary rows at the bottom of the screen are particularly useful; here they include the month-to-date plan total (Plan mtd in cell A19), the month-to-date actual total (Actual mtd in A20), and the total month plan (Plan m in A21).

The manufacturing steps extend across the top of the worksheet from left to right, starting in column B. The number of columns used to track data for each step depends on the amount of detail you need; each manufacturing step in this worksheet is slightly different, illustrating some possible variations.

Figures 1 and 2 reflect a simplified plan, showing activities at each manufacturing step as 100-pound batches of cookie dough move through the production process each week. (Figure 1 represents the worksheet with data and results of calculations; Figure 2 shows all formulas.) Manufacturing activities begin in the upper left corner of the worksheet and flow diagonally to the lower right corner.

Ins and Outs

The first manufacturing step, labeled Dough Making, spans columns B, C, and D. In column B, titled Lbs. In, record your raw materials base for each week of the month (cells B7, B10, B13, and B16). In column D, Lbs. Out, record the acceptable amount of remaining dough projected for each week (cells D7, D10, D13, and D16).

The primary assumption in this plan is that 80 percent of each week's "Ins" become the next week's "Outs." Two other assumptions also apply. The first is the *yield loss* for the step: The missing 20 percent represents the number of units that are lost during the manufacturing process because of imperfect execution. The second is the *cycle time*–how long it takes for an In to become an Out (in this example, one week). The formula in cell D10 (Figure 2), +B7*0.8, finds the yield loss by calculating 80 percent of the dough put into the process at the beginning of the previous week. In reality, cycle times for many steps are much longer, in which case you will have to adjust the Outs by additional weeks.

Column C monitors inventory of the dough at a WIP stage, mixing. For any given week, the model assumes that inventory consists of the Ins for that week that are due out the following week. The model also stipulates that this phase of the manufacturing process is half completed, and therefore that the inventory has already sustained half of the total yield loss expected for the entire process. (That is, loss is assumed to occur evenly throughout the process

	-A-	-B-	-C-	-D-	-E-	-F-	-G-
1		July	Cookie Cutter				
2			---DOUGH MAKING---			CUTTING	
3	Work Week	Lbs.	WIP	Lbs.	Dough	Lbs.	Cookies
4		In	(mix)	Out	(lbs.)	In	Cut
5	PrevPlan 4						
6							
7	Plan 1		+B7*(0.8+0.2/2)	+B5*0.8	+E5+D7-F7	+D5	+F7*H7/1000
8	Actual 1						
9							
10	Plan 2		+B10*(0.8+0.2/2)	+B7*0.8	+E7+D10-F10	+D7	+F10*H10/1000
11	Actual 2						
12							
13	Plan 3		+B13*(0.8+0.2/2)	+B10*0.8	+E10+D13-F13	+D10	+F13*H13/1000
14	Actual 3						
15							
16	Plan 4		+B16*(0.8+0.2/2)	+B13*0.8	+E13+D16-F16	+D13	+F16*H16/1000
17	Actual 4						
18							
19	Plan mtd	+B7+B10+B13+B16		+D7+D10+D13+D16		+F7+F10+F13+F16	+G7+G10+G13+G16
20	Actual mtd	+B8+B11+B14+B17		+D8+D11+D14+D17		+F8+F11+F14+F17	+G8+G11+G14+G17
21	Plan m	+B7+B10+B13+B16	+C16	+D7+D10+D13+D16	+E16	+F7+F10+F13+F16	+G7+G10+G13+G16

Figure 2: A listing of all formulas and headings in the worksheet shown in Figure 1. This display of each cell's contents was prepared with The Spreadsheet Auditor from Consumers Software of Gilroy, California.

rather than in spurts.) The formula in cell C7, +B7*(0.8+0.2/2), calculates this WIP quantity; similar calculations are made in cells C10, C13, and C16.

The Outs for Dough Making become the Ins for the next step, Cutting. The model anticipates that the Lbs. Out from the previous week will go into Cutting; thus the entry in cell F7 is +D5. Entries in cells F10, F13, and F16 similarly refer to the previous week's Lbs. Out cell. In the transition between Dough Making and Cutting activities, the pounds out are located at an inventory point titled Dough (lbs.), which follows the basic inventory equation: Inventory equals beginning on-hand units (in this case, pounds of dough) plus Ins minus Outs. In cell E7 of Figure 2, for example, the formula is +E5+D7-F7; similar formulas are entered in the rest of the column.

Since Cutting is virtually instantaneous–cut dough immediately becomes cookies–the Outs occur in the same week as the Ins, and there is no WIP calculation. Because the Cutting yield is critical, column H displays the Cookies-per-Lb. yield; it is not buried in the equation for a cell, as was the 80 percent Dough Making yield. Thus, the entry in cell G10 is +F10*H10/1000. (Dividing by 1000 expresses these values in thousands to simplify reading the worksheet; subsequent quantities of cookies are also expressed in thousands.)

By now, the principle of the worksheet should be apparent: The steps that require management decisions–such as determining how many units go into a certain step or what the Cutting yield ought to be–are numbers or values that must be keyed in. All other numbers in the worksheet are calculated according to the yield and timing assumptions built into worksheet formulas. (Whether or not you decide to use *1-2-3*'s Protect function to prevent you from accidentally writing over formulas in protected cells, it is helpful to unprotect cells requiring input.)

Baking Ins require a management decision and thus must be keyed in. The Unbaked Cookies column is therefore an inventory point (calculated in cells I7, I10, I13, and I16) that acts as a buffer between Cookies Cut and Cookies In (under Baking). The model assumes that Cookies Cut can become Cookies In during the same week, passing intact through the Unbaked Cookies inventory point. The cycle time in assembly is one week and the assumed total yield, 90 percent. Thus, like the WIP calculation used in Dough Making, the WIP (that is, the actual

-H-	-I-	-J-	-K-	-L-	-M-	-N-	-O-
		-BAKING-		-PACKAGING-		-COUNTING-	-SHIPPING-
Cookies per Lb.	Unbaked Cookies	Cookies In	WIP (baking)	Unpacked Cookies	Packed Cookies	Inventory OHE	Shipped Cookies
((G8/F8)*1000)	+I5+G7-J7		+J7*(0.9+0.1/2)	+J5*0.9	+L5*0.8	+N5+M7-07	
((G11/F11)*1000)	+I7+G10-J10		+J10*(0.9+0.1/2)	+J7*0.9	+L7*0.8	+N7+M10-010	
((G14/F14)*1000)	+I10+G13-J13		+J13*(0.9+0.1/2)	+J10*0.9	+L10*0.8	+N10+M13-013	
((G17/F17)*1000)	+I13+G16-J16		+J16*(0.9+0.1/2)	+J13*0.9	+L13*0.8	+N13+M16-016	
((G19/F19)*1000)		+J7+J10+J13+J16			+M7+M10+M13+M16		+07+010+013+016
((G20/F20)*1000)		+J8+J11+J14+J17			+M8+M11+M14+M17		+08+011+014+017
((G21/F21)*1000)	+I16	+J7+J10+J13+J16	+K16	+L16	+M7+M10+M13+M16	+N16	+07+010+013+016

time in the oven) in cell K10 is expressed as the formula +J10*(0.9+0.1/2), with similar formulas in cells K7, K13, and K16.

For purposes of brevity, the model includes only one activity step for Packaging. In contrast to Baking, however, the Outs are displayed (in column M) because that data is the more significant management parameter for this step. The formula in cell M16, +L13*0.8 (and also in cells M7, M10, and M13) assumes an 80 percent yield, with the Unpacked Cookies inventory (column L) packaged the following week.

Because the model assumes that all inventory from the previous week gets packed, the Outs from Baking in any week equal the Unpacked Cookies in cells L7, L10, L13, and L16. Again, to conserve space in this worksheet, there is no Baking Outs column.

Packaged cookies either can be shipped immediately or can be entered into packaged Inventory. Shipped Cookies (column O) must be keyed in because shipping entails a crucial management decision. Like Unbaked Cookies in column I, the on-hand ending (OHE) column is a "buffer stock," consisting of the balance between Packed Cookies and Shipped Cookies; thus, the entry in cell N16 is once again the inventory equation +N13+M16-O16. Obviously, when your buffer stock is depleted you experience product shortages.

The planned totals for the month entered in row 21, Plan m, of Figure 2 are straightforward. For the activity columns (B, D, F, G, J, M, and O), the formula in row 21 adds the four weeks. For the inventory columns (C, E, I, K, L, and N), the formula merely pulls the number from Work Week 4 in row

If sales are only half those originally planned, you can reduce the number of units sold and see the resulting inventory growth.

16, which, in addition to being the planned ending inventory for the week, is also the planned ending inventory for the month. Column H, which represents a yield, is different; while a yield was keyed in for each Work Week, the formula in cell H21 calculates the weighted average yield for the month. (The multiplication by 1000 in this formula offsets the division by 1000 in certain column G formulas.)

Once you've constructed your worksheet, go to cell B5 and set the Titles by requesting */Worksheet Titles Both*. As you scroll around the worksheet, this command will keep the column and row labels in view. In addition, format the worksheet to display

only whole numbers by typing */Worksheet Global Format Fixed 0* < **Enter** > .

When manufacturing activities are continuous, you get a worksheet that is full of numbers, as shown in Figure 1. Filling in data from the previous month (row 5) is critical. Without that data, the model assumes nothing is designated for the later manufacturing steps until new manufacturing activity works its way through the process.

Putting the Matrix to Work

With all the formulas for the manufacturing model in place, you're now in a position to let it work for you. You'll soon find that the model helps with rigorous planning, in part because of the way it integrates inventory control into the manufacturing process. Given a starting point and the manufacturing assumptions built into the equations, you can perform an almost infinite number of "what if" analyses with this worksheet. By varying the data you can forecast the results of specific courses of action.

For example, if sales are only half those originally planned, you can reduce the number of units sold and see the resulting inventory growth. If you don't want to amass inventory, you can see the impact of trimming production by adjusting the number of units made. On the other hand, if sales double you can see how much your inventory will be depleted or how much raw material you'll have to plug into the manufacturing pipeline to avoid shortages. In addition, the cycle times built into the model demonstrate how changes to a given factor ripple through subsequent steps in the manufacturing process.

By expanding the worksheet to cover more than a single month you can perform long-range planning. Or, as in this model, you can set up a monthly worksheet and copy the Plan 4 data from each month (row 16) into the succeeding month's PrevPlan 4 category (row 5)—that is, copy June's Work Week 4 data into the July worksheet.

The worksheet is also designed to compare actual events to planned events. In Figure 1 you enter the Actual data for all four weeks (rows 8, 11, 14, and 17), except in column H, which calculates Cookies per Lb. based on the Ins and Outs in columns F and G. By comparing Plan and Actual data for each week, you can determine for each step in the manufacturing process whether you're exceeding the plan, falling short, or hitting it exactly. In Work Week 1, for example, you can see that the 70 Actual Lbs. Out is lower than the planned 80, while the 163 Cookies per Lb. is higher than the planned 150, resulting in more Cookies Cut and Unbaked Cookies than planned.

Given a starting point and the manufacturing assumptions built into the equations, you can perform an almost infinite number of 'what if' analyses with this worksheet.

Not only can you track events weekly; the bottom three rows of the worksheet enable you to monitor Actual month-to-date results (row 20) versus Plan month-to-date results (row 19), and weigh your progress against the total Plan for the month (row 21). For example, even though the Actual Lbs. Out total was 10 below the amount planned in Work Week 1, it was 10 above in Work Week 2, so the Actual month-to-date total of 320 (cell D20) is the same as the Plan month-to-date total (cell D19).

To obtain the right totals in row 19, the formulas must be adjusted each week when Actual figures are entered so the Plan month-to-date totals include the number of weeks for which Actual figures have been entered. For example, the formula in cell D19 calculates the total planned for all four weeks, because the Actual figures for all four weeks have been entered. If only the first three weeks of Actual figures had been completed, however, the formula in cell D19 would have to be changed to add the Plan

figures for only the first three weeks. This formula would then read +D7+D10+D13. It is possible to adjust formulas automatically with a lookup table, but that operation is beyond the scope of this worksheet exercise. Moreover, adjusting the formula manually forces you to compare the Plan and Actual figures.

The formulas that require this adjustment are in cells B19, D19, F19, G19, J19, M19, and O19. Like the entry in cell H21, H19 calculates the planned weighted average Cookies per Lb. to date. (Note that row 20 doesn't need to be adjusted each week; it totals the activities in all four weeks, which are zero for the weeks that have not yet been entered.) No entries are made in rows 19 and 20 for the inventory points since that information is readily available on the appropriate Work Week line. Remember that inventory already represents a total.

Remaking the Model

To get a feel for this sample worksheet, consider reproducing it as is, then varying some of the data. The model's value will truly hit home when you start modifying and expanding it to realistically represent your situation.

In my own work, for example, I segment the manufacturing process into three times as many steps, create rows for the three months in a fiscal quarter, and use worksheets for two or more consecutive quarters. In a separate section I also expand on the inventory, multiplying beginning and ending inventories for each period by standard values in order to calculate planned dollar and unit inventory changes.

By updating the worksheet with the Actual figures and modifying future plans on an ongoing basis in response to changes in sales and manufacturing conditions, you can use this model as a potent management tool for guiding actions today that will meet your goals tomorrow.

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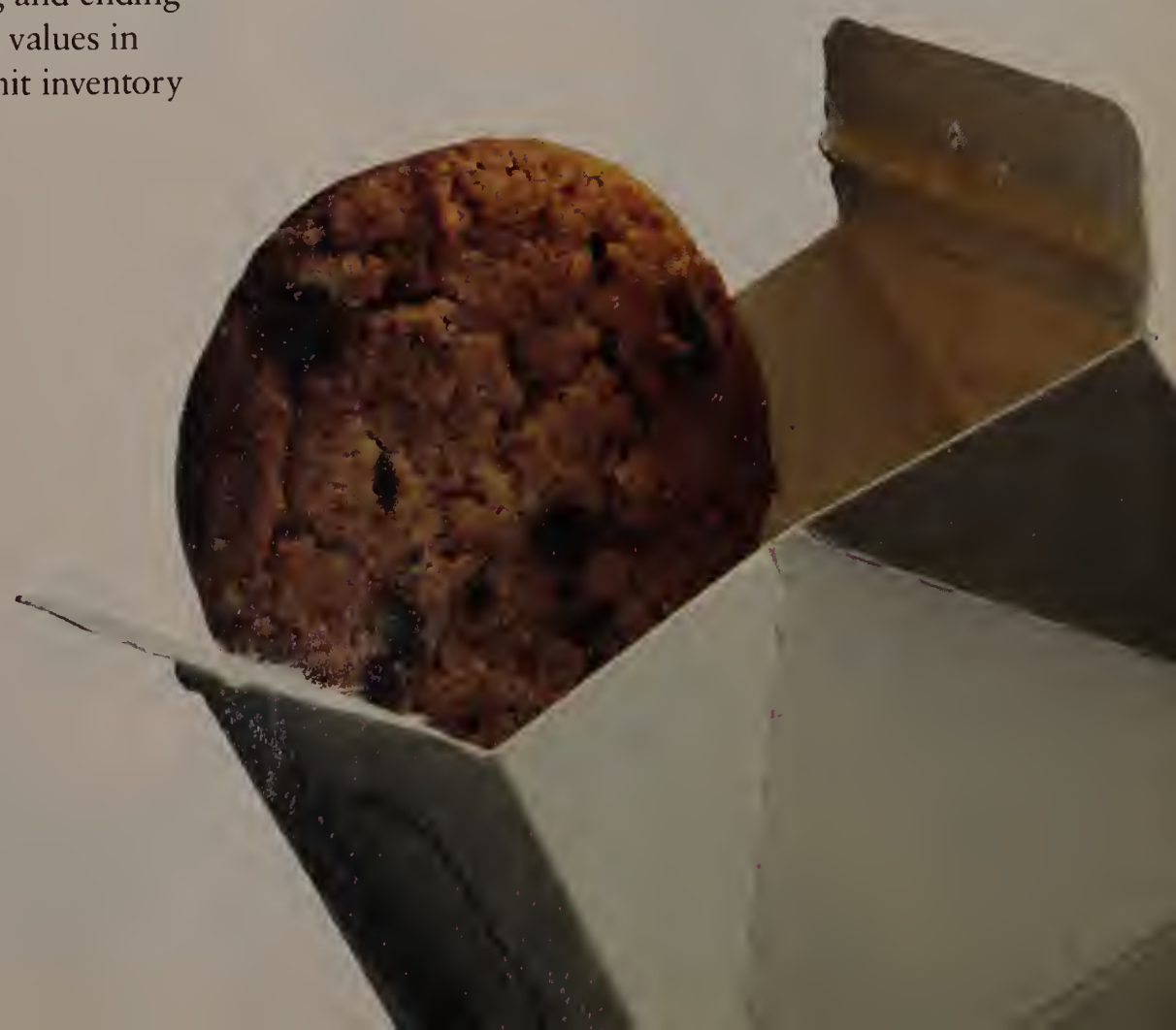
1-2-3
Lotus Development Corp.
161 First St.
Cambridge, MA 02142
617/494-1270
List price: $495
Requirements: 192K, two disk drives
Copy protected



PBX: The Network Switch

Discover the PBX, that ubiquitous office machine in control of your phones. It just might be the answer to making PCs even more conversant.

John A. Merritt

You hold the phone casually to your ear and punch a few numbers. A pause, a slight click, then a tone. It stops, starts again, then is interupted by a voice: "Hello?" It's your secretary and you ask if a report is ready for the morning staff meeting. Not a very exciting process? Think again. From the phone on your desk to the one on your secretary's, your voice travels a circuitous route through some minor technological marvels. One leg of that journey is through a bulky box known as a Private Branch Exchange, or PBX, the central controller and switching coordinator of your office's autonomous phone system (see Figure 1).

Today's PBX is more than a silicon version of tin cans and string. With the right hardware and software your secretary could transmit the report to desk-bound meeting participants sitting in front of their PCs over a route similar to the one your voice traversed just seconds earlier. This knack for transmitting both voice and data has elevated the PBX from ungainly intercom manager to ungainly—but effective—complement to local area networking. Anyone planning to electronically strap PCs together should get acquainted with the PBX.

Originally designed to replace human switchboard operators for office phone systems, PBXs are getting faster and more in tune with the world of PC communications. Although the new automated PBX has the ability to provide PC-to-PC communications, its major role may be that of arbitrator, acting as a common link among a variety of proprietary local area networks. Before thrusting your company into a PBX pigeonhole, consider the nature of the beast.

Whither PBX?

A PBX is essentially an automated switchboard, an electronic bridge between two phones. In an office, phone calls circulate through the PBX over company-owned lines, while calls placed to the outside world are handed over by the PBX to one of Ma Bell's orphaned public phone systems. Of course, PBXs do more than simply connect phones. Under microprocessor control, they can route, track, and account for calls; permit automatic redialing; provide call forwarding, holding, and transferring; and decide whether MCI, Sprint, or some equivalent is the cheapest long-distance service

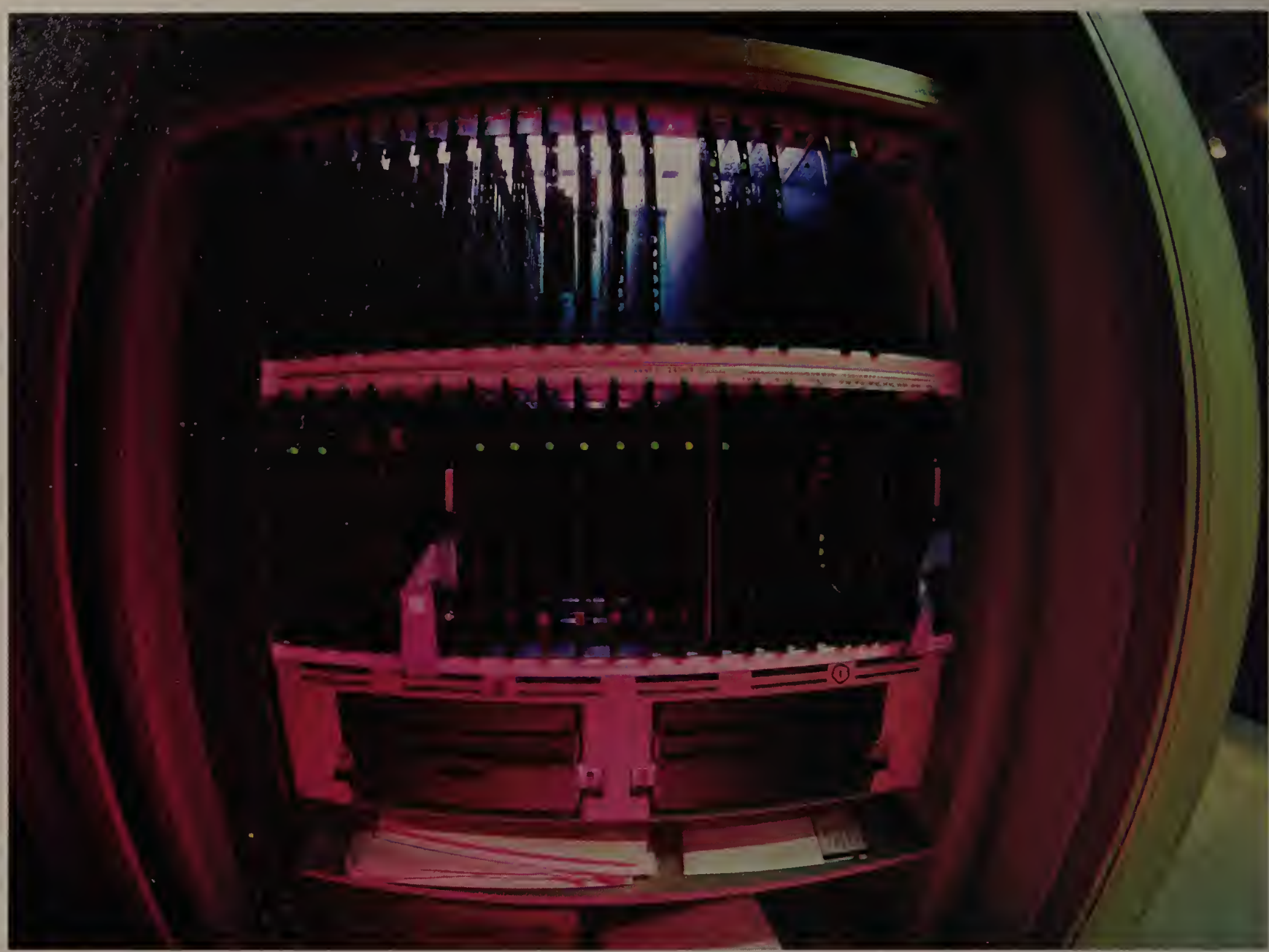


Figure 1: Ungainly but multitalented, the Saturn PBX from Siemens is a fully digital, solid-state PBX that handles phones and PCs with equal ease.

for outgoing calls. Better still, within the heart of new PBXs are many of the capabilities for PC-to-PC communications that are provided by local area networks.

All PBXs consist of five basic elements: system control, switching matrix, cabling, trunk interfacing, and telephones–and now PCs (see Figure 2). In the days of the horse-and-buggy switchboard, human operators were the *system control*, recognizing which telephones needed to communicate and manually making the necessary connections.

The *switching matrix* is the physical and electrical medium that links phones or PCs. In older setups the matrix was a central panel attached to the wires emanating from each phone. An operator would connect two phones by plugging one line into the appropriate socket connected to the other phone. When a phone was hung up, the circuit was broken by an operator pulling out a plug or flipping a switch.

Solid-state microprocessor-controlled PBXs, of course, automate this entire process. Instead of operators, the PBX's time- and frequency-division techniques regulate connections between phones

attached to the PBX. With time division, a PBX essentially allots a certain amount of time to each phone in use, transmitting conversations in precise dollops at lightning-fast speeds over the appropriate lines.

Instead of switching back and forth between phones, frequency-division techniques assign a unique frequency to calling and receiving phones. Thus, a number of calls can be routed through the PBX over one line, each conversation segregated by frequency.

Cabling is the PBX's physical wiring scheme. The wire strung between phone sets and the PBX is called twisted pair cabling, because it consists of two intertwined parallel strands of copper wire coated in plastic. When a PC is directly connected to a PBX, two extra twisted pairs are required to handle incoming and transmitted data. *Trunk interfacing* connects one elephantine PBX to another PBX, the public telephone network, or other long distance lines.

The most recognizable element of a PBX, of course, is the telephone. Originally a much more humble, single-line creature, Bell's firstborn has kept up with our high-tech times. Contemporary telephones are almost as programmable as PCs and come with an array of special function keys that let you forward calls, pick up calls on another line, automatically redial numbers, and perform a number of other functions.

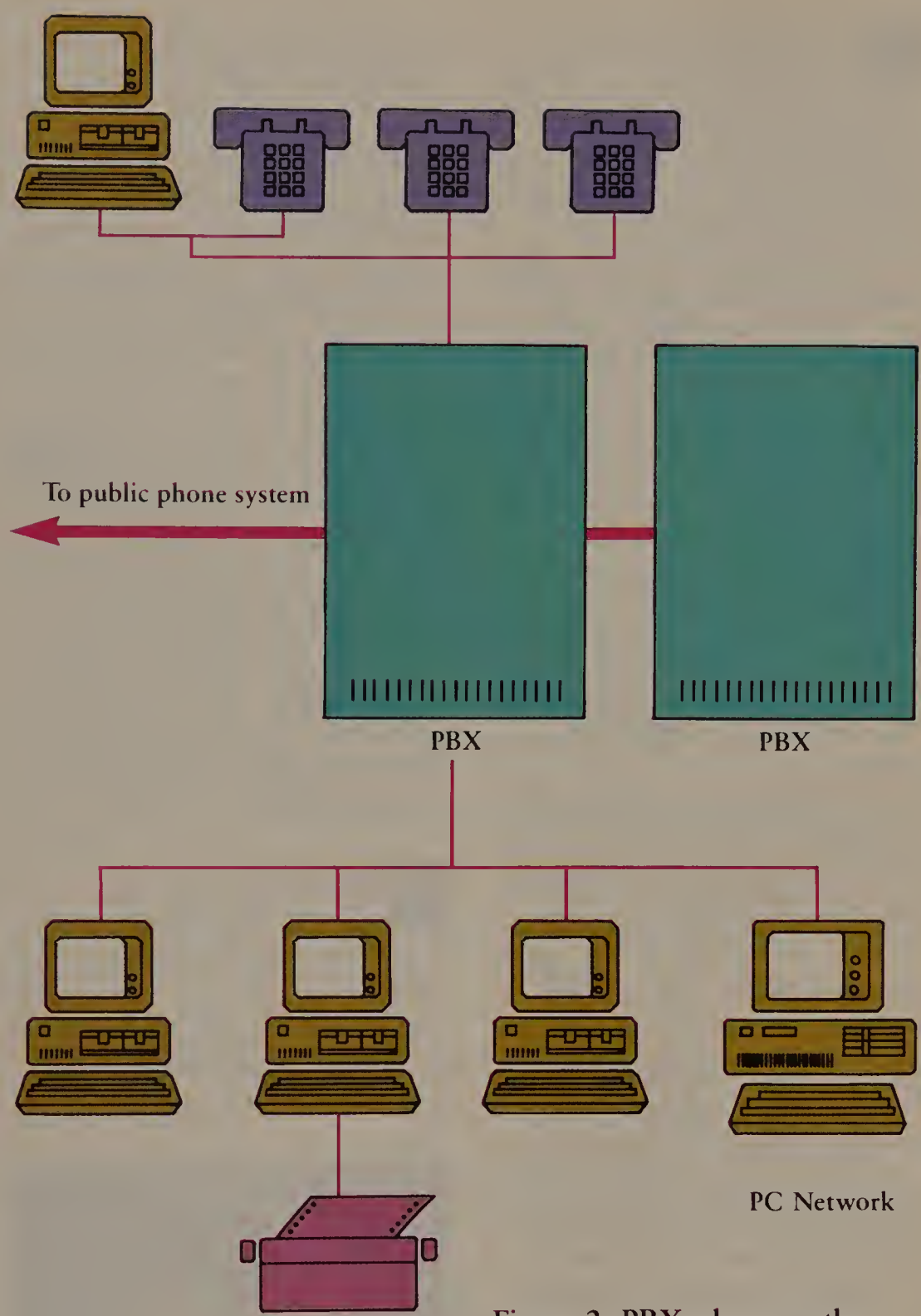


Figure 2: PBXs do more than manage phone traffic. In this setup, a PBX integrates phones and PCs and provides a gateway to several local area networks. The PBX can also be linked to other PBXs.

The PBX Family Tree

The current crop of PBXs–often labelled "third generation"–lays claim to a formidable heritage. The first generation of PBXs, mostly installed before 1975, are human-controlled, electromechanical devices that transmit only sound. Second generation PBXs replace the army of human operators with software and microprocessors. These PBXs provide all manner of telephone conveniences but are similarly confined to transmitting sound. Hitching a PC to a first or second generation PBX requires a modem to convert the PC's digital output into analog signals and back again.

Technology, of course, marches on. Several vendors have unveiled PBXs that are true digital devices. These third generation machines can hook up directly to PCs, networks, terminals, printers, disk drives, and so on with special interface boards that replace modems. PC-to-PC communications in a PBX is not unlike that in a LAN. PCs can share files with one another, swap electronic mail, or transmit documents to a workstation that has a printer. A PBX also has a far greater reach than most LANs–workstations on a PBX can be literally miles apart.

Some PBX makers are discovering that blurring the distinctions between the phone and the PC can be a profitable undertaking indeed. One notable example is the Cedar workstation from IBM subsidiary Rolm (see Figure 3). The Cedar incorporates a touch-tone phone in an IBM PC-compatible computer that plugs into Rolm's PBX. You can dial up a remote online data base, send a file to another Cedar or PC in the office, and call your stockbroker, all at the same time. Similar products from compatibles upstart Compaq and communications giants GTE and Northern Telecom are also elbowing into the market; other PBX vendors are likely to follow their lead. But can the PBX replace the LAN? It depends on who you talk to.

In This Corner . . .

Pitting PBXs against local area networks doesn't always yield conclusive results. LANs are better at high-speed, short-haul networking; PBXs, at long-distance linkups. The degree to which LAN and PBX technologies may converge is still a function of market pressures. Industry-watcher Greg Carlsted of Dataquest contends that PBXs and local area networks will continue to have different roles for at least three to five years. "New PBXs are beginning to act like high-speed local area networks," says Carlsted, but their reliability has yet to be demonstrated in the helter-skelter world of office communications.

Although attaching PCs to a PBX requires only the appropriate expansion boards, easily and quickly sharing data stored on a hard disk (called a file server) presents some serious obstacles. Scott Wolf, data PBX product manager for Gandalf Technologies, notes that using a file server on a PBX poses few problems–unless, of course, you have two or more users simultaneously trying to get at data on that drive.

"Users are always contending for data in a networking environment," says Wolf, "but unfortunately, file servers must be attached to a PBX via a serial port. Users get access to the disk on a first-come, first-served basis. It's not a very attractive approach to sharing data."

Figure 3: A PC for the PBX. Rolm's compatible machine runs most off-the-shelf software for the IBM PC and offers a phone to boot.

Solutions for getting around this bottleneck are in the works. Meanwhile, Wolf bluntly notes that "a PBX is no replacement for a LAN. But it can be a natural gateway for all kinds of networks."

PBX to Order

As the PC has evolved from office novelty to necessity, canny PBX makers have dreamt up schemes that make their product more attractive. PCs are typically scattered throughout a company, each coterie often tied together in a LAN and dedicated to a single application such as word processing or financial analysis. In an attempt to accommodate the variety of needs found in most organizations, PBX designers are decentralizing the PBX—a radical break with the everything-in-one-box approach of earlier generations.

Since each distributed PBX controls a small area, such as one floor or building, it can be customized easily. A PBX in a data processing department might be set up to simultaneously control phones and link a network of PCs to a mainframe computer; another PBX might be connected to dot matrix and letter quality printers for a word processing department. A sales group might need only voice functions. In short, a company adds only those functions it needs and can afford. Decentralizing has another bonus: A company-wide PBX failure is virtually impossible.

Keep in mind that these fourth generation PBX networks are not yet in mass production. The majority of PBXs sold today use second and third generation technologies.

Buy or Wait?

Before the arrival of third generation PBXs, local area networks were the only option for PC communications in the office. Even with the introduction of newer PBX technology, local area networks may still be the best choice in many situations. As Don Glynn, communications consultant for John Hancock Mutual Life Insurance Company, points out, "Sometimes you need to share data and devices extensively within a given department, but there is little or no need to share interdepartmentally, which makes the cost of a sophisticated PBX hard to justify."

Making the PC-to-PBX connection also fattens the price tag. Slipping a PC onto a local area network can cost anywhere from $695 to $1100; the equivalent PBX hookup can be as high as $1200, particularly when more PCs are added to the system.

Software is equally crucial and costly in a successful networking scheme. Local area network software—operating systems, data bases, word processors, and the like—is expensive and embryonic. Software developers, finally lured into the networking market by IBM's PC Network, are devoting their energies to multiuser programs for that LAN. Not surprisingly, PBX development has lagged. Only companies that can sustain the expense, such as AT&T and Northern Telecom, have created PBX-based programs.

If your company already uses a PBX or has a crushing need to control both interoffice voice and data, a mix-and-match approach may provide the most expedient and cost-effective networking solution. There's little doubt that future voice and data PBXs will increasingly encroach on the turf local area networks have staked out. The PBX promise is great, but only time in the real world will determine if it will take over the PC's networking reins—or share them.

John A. Merritt is president of Merritt Communications of Natick, Massachusetts, and a freelance writer concentrating on microcomputer communications.

World Class PC

Christine Whyte

Nineteen eighty-five may be remembered as the year of the shakeout in the computer industry. Not a few companies—both well-known and fledgling—gave up the ghost or teetered precariously on the edge of the Chapter 11 abyss. But many others with widely popular products, such as Lotus Development and Ashton-Tate, vigorously defended their positions as industry leaders. Public confidence in these battle-scarred survivors remains strong year after year, as the results of the third annual World Class PC contest clearly demonstrate. This year's contest also welcomes several newcomers to the ranks of World Class winners—those who dared to gamble on innovation instead of imitation, and won.

pfs: file
PASCAL
1-2-3

In the March 1985 issue, *PC World* asked readers to vote in each of 38 hardware and software categories for one product that was tops in performance and value. With a few notable exceptions, the winners' circle is crowded with familiar faces. Given the here-today, gone-tomorrow nature of this industry, it seems that most *PC World* readers (and likely most PC users) are playing it safe and sticking to what they know and, presumably, like. Contrary to the frantic pace so alluring to industry insiders, buyers are seduced by stability rather than the newest trend on the block. To scale the heights and woo buyers away from the tried and true, a product must be clearly superior or unique.

World Class Prizes

For the first time, the World Class PC contest awards winning products to four (instead of two) lucky individuals whose contest entry forms were selected from among thousands in a random drawing by *PC World* Publisher David Bunnell. Each year the contest has expanded to include more product categories, consequently boosting the contest's total prize value.

The 1985 World Class PC contest grand prize, worth $29,210.45, consists of a PC AT, the readers' favorite desktop computer, plus the winning peripherals and software in 33 categories spanning everything from modems and hard disks to spreadsheets and word processors. The only unawarded product is the favorite local area network. This new category was included to discover reader preference and level of interest, which turned out to be surprisingly low.

Second prize is the Compaq Portable Computer, voted the most popular transportable computer. Awarded as third prize is the most acclaimed lap-size computer (not required to be PC compatible to receive votes), the Data General/One, which probably topped the list because of its sophisticated features and high PC compatibility.

Fourth prize is the most popular under-$1200 recreational computer used at home or at school (again, not required to be PC compatible). Not surprisingly, the only PC-compatible home computer, the PCjr, won in this category even though IBM stopped production of the machine about the time the contest was announced.

PC World congratulates all the hardware and software manufacturers whose products were named as 1985 World Class winners. Although reader votes should not be construed as endorsements of the winning products by *PC World*, they do signify the readers' seal of approval.

Luck of the Draw

Suspense mounts. A hush falls over the crowd as David Bunnell reaches into the revolving bin of contest entry forms; the neon flashes—Anotha Winna!

The grand-prize winner is Joseph R. Decillis of Newark, Delaware, who pinched himself and called *PC World* back an hour after receiving the news, just to make sure he hadn't dreamed the whole thing. As general manager for a footwear wholesaler, Mr. Decillis uses *dBASE III* and *SuperCalc 3* to produce management reports on cash flow, cost analysis, and inventory control. Since he does not own a PC, he was thrilled at his good fortune.

To scale the heights and woo buyers away from the tried and true, a product must be clearly superior or unique.

Ron Schwebs of Deltona, Florida, won the second prize, a Compaq Portable Computer. He does BASIC programming as a research analyst for a county agency and is delighted that he can now get some work done at home (we won't hold him to his word).

Third-prize winner of the Data General/One is Vincent S. Vitali of Lombard, Illinois. He provides technical support and recommends hardware and software purchases for his health care administration company. Charles T. Dick of Cincinnati, Ohio, won the fourth prize, a PCjr. He hopes his two young children will enjoy PC educational and games software, most of which runs on the Jr.

Products on Parade

In addition to the winning product for each hardware and software category, the following tables list products that received a significant number of votes. Each product's percentage of the total votes cast in its category is reported. The "Others" entry notes the combined percentage for all products that failed to receive at least two percent of the votes (with one exception in the Financial Modeling category). The percentage of respondents who voted in each category presumably indicates reader experience with or interest in that kind of product.

The World Class PC contest added 10 new software categories this year for a whopping total of 23. *PC World* created the Integrated category to accommodate the large number of programs introduced since last year's contest that provide several applications in one package. *Symphony* is the winner, and the ever-flexible *1-2-3* follows in second place. The third-, fourth-, and fifth-place products–*Framework*, *Enable*, and *The Smart System*–are all successful newcomers.

Although *PC World* added a Project Management category to reflect that new, prolific breed of software, last year's Business Management winner–*Harvard Project Manager*–crossed over to outdo the many newcomers. This program was among the first of its kind for the PC, and evidently our readers think it's still the best.

Two new Investment products share the limelight in the contest's first-ever tie: *Dow Jones Market Manager Plus* and *Andrew Tobias' Managing Your Money*. The former replaces last year's winning *Dow Jones Investment Evaluator,* which received votes this year even though it is no longer on the market. The multifaceted *Andrew Tobias' Managing Your Money* also wins in Personal Management (it does budgeting) and places third in the Tax Planning category.

PC World defined the Financial Modeling category with dedicated financial modeling programs in mind, including those descended from mainframe forebears. Surprisingly, only one product fitting this narrow definition received a significant number of votes–*Micro/Prophit* from Via Computer. Again, our readers prefer to stay with familiar products and stretch them to fit any application.

The new Tax Planning or Preparation category spotlights a successful but not-so-new product: *Tax Preparer* from HowardSoft. The Decision Making category was created in response to a new crop of programs that turn the PC into a consultant able to rank in importance the elements in a project. Interestingly, none of these specially designed products, such as *Lightyear* from Lightyear, Inc., received a significant number of votes. Instead, we found that *PC World* readers largely use humbler decision support software such as *1-2-3* and *ThinkTank* for plotting corporate courses.

Borland International's Side-Kick *shows that a new idea at the right price is often unbeatable.*

Borland International's *SideKick* easily won the Desktop Manager derby by ten lengths–which shows that a new idea at the right price is often unbeatable.

This year *PC World* created a new category, Training, for application tutorials. The favorite is *ATI's Training Power Series,* which won in the Education category last year.

Another Borland International product, Turbo Pascal, created a big upset in the Language category by leaving last year's first-place product, IBM BASIC, in the dust. As a structured language, Pascal has long been a favorite in academia, but Turbo Pascal's crossover into mainstream prominence is attributable to its speed, ease of use, and affordability. True BASIC, a new structured version of BASIC from the language's originators, John Kemeny and Thomas Kurtz, may turn the tide and revive academic and

general interest in this language. Watch next year's World Class PC contest for BASIC progeny.

PC-Draw squeaks by with the blue ribbon in a new Graphics category for drawing programs, with three other products in hot pursuit. *PC-Draw* is an old-timer compared to the new generation of painting programs and, unlike them, does not "draw" its inspiration from *MacPaint*'s screen design.

The Applications Integrator category, which highlights software that integrates off-the-shelf applications, shows IBM's *TopView* as the favorite. (*Microsoft Windows* was not on the market until well after the contest entry deadline.) Two products that don't exactly fit—*Framework* and *SideKick*—may have received votes because the former can, in certain circumstances, incorporate off-the-shelf applications, while the latter lets you cut and paste data between applications.

1-2-3 deserves a round of applause for winning in no less than four categories.

Two Communications products have traded first and second places every year of the contest. *Crosstalk XVI,* first-place winner in 1983 and runner-up last year, has regained World Class status by beating out its major competitor, *Smartcom II; PC-Talk III* remains nestled in third place. Since the World Class PC contest began, no other program has come close to challenging these three favorites.

1-2-3 deserves a round of applause for winning in no less than four categories: Spreadsheet, of course, Business Graphics, Financial Modeling, and Decision Making. In Word Processing, *WordStar* still holds a strong lead against stiff competition from at least three other popular programs: *MultiMate, WordPerfect 4.0,* and *Microsoft Word.*

PC World added four new hardware categories to this year's contest: three types of computers and Local Area Network. Aside from these new categories, the 1985 hardware winners are the same as last year's with only two exceptions. The first is in the Color Graphics Board category, where the Hercules Color Card pushes last year's winner, the IBM Color/Graphics Adapter, into second place.

The second newcomer to the ranks of World Class PC hardware winners is the Iomega Bernoulli Box, which received the most votes in the Hard Disk Storage category although it does not use rigid disk media. The most popular Iomega unit consists of two 10MB removable cartridges—each containing an 8-inch floppy disk—housed with a power supply in a system unit. Additional cartridges can be purchased for unlimited, removable storage. The Iomega Bernoulli Box is reputedly as fast as if not faster than a conventional hard disk drive, more reliable (virtually immune to head crashes and data damage), and simpler to back up.

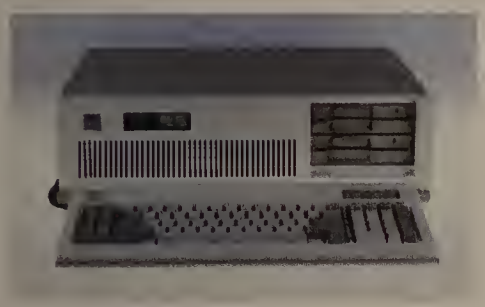
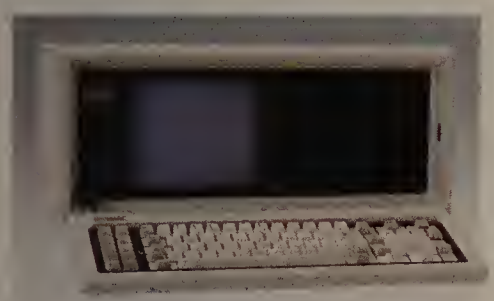
Since the contest had no category for alternate storage media such as the Bernoulli Box, *PC World* decrees two winners in the Hard Disk Storage category. The other winner is the hard disk drive receiving the most votes—the Tallgrass TG-3020.

Be sure to look for the 1986 World Class PC contest announcement and entry form in a future issue of *PC World.* It's your opportunity to express yourself and take a shot at winning valuable prizes.

Christine Whyte is the Product Review Editor for PC World.

Hardware

Winning Products for the World Class PC Contest

	% of Votes	Product, *Manufacturer*
Desktop Computer 94% of respondents voted in this category	40	IBM PC AT, *IBM* Entry Systems Division, P.O. Box 1328, Boca Raton, FL 33432, 800/447-4700, 800/447-0890 Alaska and Hawaii, 800/322-4400 Illinois List price: $4090 (basic system with 512K)
	21	IBM PC, *IBM*
	18	IBM PC XT, *IBM*
	6	Compaq Deskpro (no hard disk), *Compaq Computer Corp.*
	5	Compaq Deskpro (hard disk), *Compaq Computer Corp.*
	10	Others
	100	Total
Transportable Computer 66% of respondents voted in this category	42	Compaq Portable Computer, *Compaq Computer Corp.* 20555 FM 149, Houston, TX 77070, 713/370-0670 List price: $2699
	36	Compaq-Plus Portable Computer, *Compaq Computer Corp.*
	11	IBM Portable Personal Computer, *IBM*
	4	Sr. Partner, *Panasonic*
	7	Others
	100	Total
Lap-Size Computer 54% of respondents voted in this category	69	Data General/One, *Data General Corp.* 4400 Computer Dr. MS E132, Westboro, MA 01580, 617/377-8911 List price: $3495
	17	HP 110 Portable, *Hewlett-Packard*
	5	Model 100, *Tandy Corp.*
	2	Model 200, *Tandy Corp.*
	2	GRiD Compass, *GRiD Systems Corp.*
	5	Others
	100	Total
Recreational Computer 48% of respondents voted in this category	47	IBM PCjr, *IBM* 1000 N.W. 51st St., Boca Raton, FL 33432, 800/222-PCJR List price: $1124
	15	Apple IIC, *Apple Computer, Inc.*
	12	Commodore 64, *Commodore Electronics, Ltd.*
	6	Apple IIE, *Apple Computer, Inc.*
	5	Macintosh, *Apple Computer, Inc.*
	15	Others
	100	Total

Hardware

Winning Products for the World Class PC Contest

	% of Votes	Product, *Manufacturer*
Color Monitor 60% of respondents voted in this category	26	HX-12, *Princeton Graphic Systems* 601 Ewing St., Bldg. A, Princeton, NJ 08540, 800/221-1490 List price: $695
	23	IBM Color Display, *IBM*
	21	SR-12, *Princeton Graphic Systems*
	7	IBM Enhanced Color Display, *IBM*
	23	Others
	100	Total
Hard Disk Storage 36% of respondents voted in this category	26	Iomega Bernoulli Box, *Iomega Corp.* 1821 W. 4000 S, Roy, UT 84067, 801/778-1000 List price: $3695,20MB dual-drive model (not pictured)
	10	Tallgrass TG-3020 (20MB/20MB tape), *Tallgrass Technologies* 11100 82nd St., Overland Park, KS 66214, 913/492-6002 List price: $3395
	8	Tallgrass TG-3012 (12MB/20MB tape), *Tallgrass Technologies*
	8	PCi10, *Maynard Electronics*
	7	IBM PC 10M Fixed Disk Drive, *IBM*
	7	PC10, *Qubié Distributing*
	5	Sysgen XL, *Sysgen Inc.*
	29	Others
	100	Total
Printer–Dot Matrix 82% of respondents voted in this category	18	FX-100, *Epson America, Inc.* 2780 Lomita Blvd., Torrance, CA 90505, 213/539-9140 List price: $699
	10	LQ-1500, *Epson America, Inc.*
	10	P1351, *Toshiba America, Inc.*
	9	FX-80, *Epson America, Inc.*
	8	Microline 92, *Okidata*
	8	Microline 93, *Okidata*
	5	Omni Series Model 855, *Texas Instruments, Inc.*
	4	RX-80, *Epson America, Inc.*
	28	Others
	100	Total
Printer–Letter Quality 56% of respondents voted in this category	20	NEC Spinwriter Model 3550, *NEC Information Systems, Inc.* 1414 Massachusetts Ave., Boxborough, MA 01719, 617/264-8000 List price: $1440
	19	Hewlett-Packard LaserJet, *Hewlett-Packard*
	9	Quietwriter, *IBM*
	9	Model 630 ECS, *Diablo Systems, Inc.*
	6	NEC Spinwriter Model 8850, *NEC Information Systems, Inc.*
	5	Wheelprinter, *IBM*
	4	Starwriter F10 Daisywheel, *C. Itoh Electronics, Inc.*
	28	Others
	100	Total

	% of Votes	Product, *Manufacturer*
Modem 68% of respondents voted in this category	40	Smartmodem 1200, ***Hayes Microcomputer Products, Inc.*** P.O. Box 105203, Atlanta, GA 30348, 404/449-8791 List price: $599
	34	Smartmodem 1200B, *Hayes Microcomputer Products, Inc.*
	8	Smartmodem 2400, *Hayes Microcomputer Products, Inc.*
	5	PC212A, *Qubié Distributing*
	3	Smartmodem 300, *Hayes Microcomputer Products, Inc.*
	2	1200 Plus, *Ven-Tel, Inc.*
	2	ProModem 1200, *Prometheus Products*
	6	Others
	100	Total
Plotter 24% of respondents voted in this category	60	HP 7475A Plotter, ***Hewlett-Packard*** 16399 W. Bernardo Dr., San Diego, CA 92127, 619/487-4100 List price: $1895
	17	HP 7470A Plotter, *Hewlett-Packard*
	6	IBM 7372 Plotter, *IBM*
	5	Colorwriter, *Gould*
	4	HIPLOT DMP-40 Plotter, *Houston Instrument*
	8	Others
	100	Total
Color Graphics Board 49% of respondents voted in this category	26	Hercules Color Card, ***Hercules Computer Technology, Inc.*** 2550 Ninth St., Berkeley, CA 94710, 415/540-6000 List price: $245
	22	IBM Color/Graphics Adapter, *IBM*
	11	IBM Enhanced Graphics Adapter, *IBM*
	10	Graphics Master, *Tecmar*
	4	Colorplus, *Plantronics Enhanced Graphics Products*
	4	Quadcolor I and II, *Quadram Corp.*
	4	IBM Professional Graphics Adapter, *IBM*
	19	Others
	100	Total
Combination Board 62% of respondents voted in this category	52	SixPakPlus, ***AST Research, Inc.*** 2121 Alton Ave., Irvine, CA 92714, 714/863-1333 List price: $895 (with 320K)
	13	Expanded Quadboard, *Quadram Corp.*
	6	Advantage!, *AST Research, Inc.*
	5	MegaPlus II Multifunction RAM Board, *AST Research, Inc.*
	5	Captain, *Tecmar*
	19	Others
	100	Total

Disk Drives

34% of respondents voted in this category

% of Votes	Product, *Manufacturer*
37	TM 100-2, *Tandon Corp.* 20320 Prairie St., Chatsworth, CA 91311, 818/993-6644 List price: $290
17	FD Series, *Teac Corp. of America*
14	9400 Series, *Control Data Corp.*
11	IBM PC Floppy Disk Drives, *IBM*
21	Others
100	Total

Input Device

23% of respondents voted in this category

% of Votes	Product, *Manufacturer*
30	Microsoft Mouse, *Microsoft Corp.* 10700 Northup Way, Bellevue, WA 98004, 206/828-8080 List price: $195
22	KB5151 Deluxe IBM PC Keyboard, *Key Tronic Corp.*
19	PC Mouse, *Mouse Systems Corp.*
7	IBM PC Keyboard, *IBM*
4	KoalaPad Touch Tablet, *Koala Technologies Corp.*
2	IBM PC AT Keyboard, *IBM*
16	Others
100	Total

Local Area Network

16% of respondents voted in this category

% of Votes	Product, *Manufacturer*
23	EtherSeries, *3Com Corp.* 1365 Shorebird Way, Mountain View, CA 94043, 415/961-9602 List price: $3295 (four-PC configuration)
19	PCnet, *Orchid Technology*
9	Omninet, *Corvus Systems, Inc.*
9	Netware/S-Net, *Novell, Inc.*
7	PC Network, *IBM*
7	PC Net II, *AST Research, Inc.*
3	Net/One, *Ungermann-Bass, Inc.*
23	Others
100	Total

Software

Winning Products for the World Class PC Contest

Spreadsheet

78% of respondents voted in this category

% of Votes	Product, *Manufacturer*
71	**1-2-3, *Lotus Development Corp.*** Customer Support, 55 Cambridge Pkwy., Cambridge, MA 02142, 617/577-8500 List price: $495
8	SuperCalc 3, *Sorcim Corp.*
7	Multiplan, *Microsoft Corp.*
6	Symphony, *Lotus Development Corp.*
8	Others
100	Total

Data Base–Major

60% of respondents voted in this category

% of Votes	Product, *Manufacturer*
52	**dBASE III, *Ashton-Tate*** 10150 W. Jefferson Blvd., Culver City, CA 90231, 213/204-5570 List price: $695
16	dBASE II, *Ashton-Tate*
7	R:base 4000, *MicroRim, Inc.*
4	Knowledgeman, *Micro Data Base Systems, Inc.*
3	Revelation, *Cosmos, Inc.*
2	Cornerstone, *Infocom, Inc.*
16	Others
100	Total

Word Processing

85% of respondents voted in this category

% of Votes	Product, *Manufacturer*
21	**WordStar, *MicroPro International Corp.*** 33 San Pablo Ave., San Rafael, CA 94903, 415/499-1200 List price: $350
13	MultiMate, *Multimate International Corp.*
12	WordPerfect 4.0, *Satellite Software International*
10	Microsoft Word, *Microsoft Corp.*
7	Volkswriter Deluxe, *Lifetree Software, Inc.*
7	WordStar 2000 Plus, *MicroPro International Corp.*
3	DisplayWrite 2, *IBM*
3	pfs:write, *Software Publishing Corp.*
3	PC-Write, *Quicksoft*
2	XyWrite II Plus, *XyQuest, Inc.*
2	EasyWriter II, *Sorcim/IUS Micro Software*
17	Others
100	Total

	% of Votes	Product, *Manufacturer*
Communications 50% of respondents voted in this category	34	Crosstalk XVI, *Microstuf, Inc.* 1000 Holcomb Woods Pkwy. #440, Roswell, GA 30076, 404/998-3998 List price: $195
	26	Smartcom II, *Hayes Microcomputer Products, Inc.*
	21	PC-Talk III, *The Headlands Press, Inc.*
	2	Relay, *VM Personal Computing*
	17	Others
	100	Total

Graphics–Business 28% of respondents voted in this category	21	1-2-3, *Lotus Development Corp.* Customer Support, 55 Cambridge Pkwy., Cambridge, MA 02142, 617/577-8500 List price: $495
	14	Microsoft Chart, *Microsoft Corp.*
	13	ChartMaster, *DecisionResources*
	6	Symphony, *Lotus Development Corp.*
	6	pfs:graph, *Software Publishing Corp.*
	4	Energraphics, *Enertronics Research, Inc.*
	36	Others
	100	Total

Integrated 43% of respondents voted in this category	32	Symphony, *Lotus Development Corp.* Customer Support, 55 Cambridge Pkwy., Cambridge, MA 02142, 617/577-8500 List price: $695
	23	1-2-3, *Lotus Development Corp.*
	22	Framework, *Ashton-Tate*
	7	Enable, *The Software Group*
	4	The Smart System, *Innovative Software, Inc.*
	12	Others
	100	Total

	% of Votes	Product, *Manufacturer*
Accounting 25% of respondents voted in this category	16	Peachtree's Business Accounting System, ***Peachtree Software, Inc.*** 3445 Peachtree Rd. NE, Atlanta, GA 30326, 800/554-8900 List price: eight modules $4760, each module $595
	9	Easy Business Accounting Series, *Sorcim/IUS Micro Software*
	8	BPI Systems Business Accounting Software, *BPI Systems*
	8	Open Systems Accounting Software, *Open Systems*
	6	Solomon III, *TLB, Inc.*
	5	RealWorld MBSI Accounting Software, *RealWorld Corp.*
	48	Others
	100	Total
Project Management 18% of respondents voted in this category	46	Harvard Project Manager, ***Harvard Software, Inc.*** 521 Great Rd., Littleton, MA 01460, 617/486-8431 List price: $395
	26	Microsoft Project, *Microsoft Corp.*
	8	Project Scheduler 5000, *Scitor Corp.*
	20	Others
	100	Total
Investment 11% of respondents voted in this category	17	Dow Jones Market Manager Plus, ***Teleware, Inc., and Dow Jones & Co., Inc.*** P.O. Box 300, Princeton, NJ 08540, 800/257-5114 outside New Jersey, 609/452-1511 List price: $249
	17	Andrew Tobias' Managing Your Money, ***MECA*** 285 Riverside Ave., Westport, CT 06880, 203/222-1000 List price: $199.95 (Pictured under Personal Management)
	7	Dow Jones Investment Evaluator, *Dow Jones & Co., Inc.*
	59	Others
	100	Total

	% of Votes	Product, *Manufacturer*
Financial Modeling 16% of respondents voted in this category	41	1-2-3, *Lotus Development Corp.* Customer Support, 55 Cambridge Pkwy., Cambridge, MA 02142, 617/577-8500 List price: $495
	14	Symphony, *Lotus Development Corp.*
	4	Dow Jones Market Analyzer, *Dow Jones & Co., Inc.*
	3	PC/Professional Finance Program II, *Best Programs, Inc.*
	3	TK!Solver, *Software Arts, Inc.*
	1	Micro/Prophit, *Via Computer, Inc.*
	34	Others
	100	Total

Tax Planning or Preparation 18% of respondents voted in this category	31	Tax Preparer, *HowardSoft* 8008 Girard Ave. #310, La Jolla, CA 92037, 619/454-0121 List price: $295
	27	PC/TaxCut, *Best Programs, Inc.*
	6	Andrew Tobias' Managing Your Money, *MECA*
	36	Others
	100	Total

Data Base–Index File 36% of respondents voted in this category	20	pfs:file, *Software Publishing Corp.* 1901 Landings Dr., Mountain View, CA 94043, 415/962-8910 List price: $140
	15	PC-File, *Jim Button*
	10	1-2-3, *Lotus Development Corp.*
	9	dBASE III, *Ashton-Tate*
	5	dBASE II, *Ashton-Tate*
	41	Others
	100	Total

	% of Votes	Product, *Manufacturer*
Decision Making 8% of respondents voted in this category	16	1-2-3, *Lotus Development Corp.* Customer Support, 55 Cambridge Pkwy., Cambridge, MA 02142, 617/577-8500 List price: $495
	15	ThinkTank, *Living Videotext, Inc.*
	7	Framework, *Ashton-Tate*
	3	Harvard Project Manager, *Harvard Software, Inc.*
	59	Others
	100	Total
Desktop Manager 35% of respondents voted in this category	75	SideKick, *Borland International, Inc.* 4585 Scotts Valley Dr., Scotts Valley, CA 95066, 800/742-1133, 800/255-8008 in California, 408/438-8400 List price: $84.95 (not copy protected), $54.95 (copy protected)
	9	The Desk Organizer, *Warner Software, Inc.*
	5	Spotlight, *Software Arts*
	2	PolyWindows, *Polytron*
	9	Others
	100	Total
Education 12% of respondents voted in this category	13	Spinnaker Educational Games, *Spinnaker Software* One Kendall Square, Cambridge, MA 02139, 617/494-1200 List price: $20.95–$39.95
	11	Math Blaster, *Davidson & Associates*
	3	Mastering the SAT, *CBS Software*
	2	Computer Preparation for the SAT, *Harcourt Brace Jovanovich, Publisher*
	71	Others
	100	Total
Training 10% of respondents voted in this category	50	ATI's Training Power Series, *American Training International* 12638 Beatrice St., Los Angeles, CA 90066, 800/421-4827 outside California, 213/823-1129 List price: $75 each
	13	Individual Software Series, *Individual Software, Inc.*
	8	Cdex Corporation Series, *Cdex Corp.*
	3	Typing Tutor III, *Simon & Schuster*
	2	MasterType, *Scarborough Systems*
	24	Others
	100	Total

Software

Winning Products for the World Class PC Contest

	% of Votes	Product, *Manufacturer*
Language 40% of respondents voted in this category	39	Turbo Pascal, ***Borland International, Inc.*** 4585 Scotts Valley Dr., Scotts Valley, CA 95066, 800/556-2283, 800/255-8008 in California, 408/438-8400 List price: $69.95
	11	Lattice C Compiler, *Lifeboat Associates*
	10	BASIC Compiler, *Microsoft Corp.*
	9	IBM BASIC, *IBM*
	6	Microsoft C Compiler, *Microsoft Corp.*
	25	Others
	100	Total
Personal Management 15% of respondents voted in this category	38	Andrew Tobias' Managing Your Money, *MECA* 285 Riverside Ave., Westport, CT 06880, 203/222-1000 List price: $199.95
	16	Dollars and Sense, *Monogram*
	11	The Home Accountant Plus, *Arrays Inc./Continental Software*
	5	PC/Professional Finance Program II, *Best Programs, Inc.*
	30	Others
	100	Total
Games 43% of respondents voted in this category	56	Microsoft Flight Simulator, ***Microsoft Corp.*** 10700 Northup Way, Bellevue, WA 98004, 800/426-9400 outside Washington, 206/828-8080 List price: $49.95
	7	Zork I, II, and III; *Infocom, Inc.*
	6	Nightmission Pinball, *Sublogic Communications Corp.*
	5	Sargon III, *Hayden Software*
	26	Others
	100	Total

	% of Votes	Product, *Manufacturer*
Graphics–Drawing 23% of respondents voted in this category	17	PC-Draw, *Micrografx, Inc.* 1820 N. Greenville Ave., Richardson, TX 75081, 214/234-1769 List price: $395
	16	PC Paint, *Mouse Systems*
	14	AutoCAD, *Autodesk, Inc.*
	12	PC Paintbrush, *Z-Soft*
	5	Dr. HALO, *Lifeboat Associates*
	36	Others
	100	Total
Utilities 47% of respondents voted in this category	63	Norton Utilities, *Peter Norton Computing, Inc.* 2210 Wilshire Blvd., Santa Monica, CA 90403, 213/399-3948 List price: $99.95
	9	ProKey, *RoseSoft, Inc.*
	5	Copy II PC, *Central Point Software, Inc.*
	2	Sideways, *Funk Software*
	2	Copywrite, *Quaid*
	19	Others
	100	Total
Applications Integrator 11% of respondents voted in this category	31	TopView, *IBM* Customer Relations, 100 N.W. 51st St., Boca Raton, FL 33432, 800/447-4700 List price: $149
	25	DesQ, *Quarterdeck Office Systems*
	6	Framework, *Ashton-Tate*
	6	SideKick, *Borland International*
	4	GEM, *Digital Research, Inc.*
	28	Others
	100	Total
Terminal Emulator 16% of respondents voted in this category	26	IRMA, *Digital Communications Associates, Inc.* 1000 Alderman Dr., Alpharetta, GA 30201, 404/442-4000 List price: $1195
	14	Crosstalk XVI, *Microstuf, Inc.*
	5	IBM 3101 Emulation, *IBM*
	55	Others
	100	Total

Europe: Accent on Competition

The European personal computer marketplace is jammed with opportunities and obstacles for both American and European companies, but the Europeans need to play catch-up to compete.

Janette Martin

Think of Europe and you're likely to envision royalty at Buckingham Palace, the flying buttresses of Notre Dame, castles lining the Rhine, and the exquisite frescoes of the Sistine Chapel. Europe's image is bound up with both tradition and cultural diversity. For companies and consumers in the European personal computer marketplace, it's an image packed with potential and laden with problems.

The European reverence for history suggests a certain suspicion of change, a reluctance to embrace new technologies. This resistance, complicated by economic factors, places Europe a year or two behind the United States in the

USA

number of personal computers and the variety of business applications in use: Today, the European computer market bears a striking resemblance to the American market of two years ago. Europe is primed to enjoy explosive growth resulting from falling prices of computers and peripherals.

Table 1: Unit sales of personal computers in the $1000-to-$5000 range (in millions)

	1984	1989 (estimated)	Market increase 1984-1989
U.S.	4.1	9.3	127%
Europe	1.1	4.6	318%

Source: Dataquest, San Jose, California

A New Frontier

For American and European manufacturers, Europe represents a competitive frontier. Dataquest, a San Jose, California-based market research firm, predicts that European sales of personal computer systems in the $1000-to-$5000 range will increase by more than 300 percent between 1984 and 1989, compared to a projected sales growth of 127 percent in the U.S. for the same period (see Table 1). The greatest immediate activity is likely to occur in Italy, followed by France, West Germany, and Britain, in that order.

That growth will be accompanied by a formidable set of challenges. Every player in the market must grapple with the Continent's linguistic and cultural barriers and even, on occasion, with nationalistic obstinance. While the American market is a relatively cohesive entity, European disparateness is a marketing fact of life. As Alan Nonnenberg, major accounts marketing manager of Hewlett-Packard's personal computer group, recently observed, "I don't believe there is a European market—there are really about 14 separate markets consisting of the individual countries in Western Europe."

Rising to the challenge, American manufacturers are crossing the Atlantic in pioneering style. Increasingly, however, Europeans are refusing to sit back and allow American companies to grab an ever-larger share of personal computer sales on their home turf. They are simultaneously educating their citizens about computers and launching well-funded research and manufacturing efforts to capture a major share of the market.

European-Style Computing

When it's time to buy a PC, caution is generally the byword among European small business and corporate users—a restraint enforced by limited capital and the relatively high cost of systems. Like a show-me Missourian, potential buyers typically want to know what the computer can do for them before carefully weighing benefits against costs.

Throughout Europe, businesses acquire personal computers and software for specific applications rather than as personal productivity tools for individual staff members. Even in Britain, which currently leads the Continent in personal computer sales, you won't often find a personal computer on an executive's desk or in a middle manager's briefcase. Instead, machines are generally ensconced in accounting departments, handling spreadsheets or financial applications, or in warehouses, running data management or inventory programs.

The other major themes among Europe's corporate users are economy and simplicity. Thus far, most European businesses have had difficulty justifying the cost of specialized—and sometimes flashy—peripherals and systems. Desktop personal computers far outsell portable and briefcase machines. Dot matrix and daisy wheel printers predominate, while the newer ink jet and laser printers remain scarce.

As a corollary of their availability and functionality, American spreadsheet, word processing, and data base management packages have a hold on the personal computer market abroad. Homegrown software is usually designed with a specific task in mind. Consider Britain's *FT Moneywise,* a financial modeling package marketed jointly by Moneywise Software and London's *Financial Times;* it resembles a spreadsheet but is designed to compute specific functions such as compound interest and net present value. The program's general calculation functions are limited.

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IBM's Head Start

In the joust for European market share, IBM's advantages over its rivals–both local and U.S.-based–are legion. Its sizable installed base of mainframes throughout Europe translates into name recognition and sales cachet when wooing this diverse market with PC products. IBM's longtime presence on the European scene, combined with its economic muscle, places the company in an enviable position (particularly in light of the Common Market's recent decision to end an antitrust action against IBM).

The numbers confirm IBM's swift emergence as a leader in the European personal computer market. According to InfoCorp, a Silicon Valley-based market research firm, IBM will sell an estimated 241,000 PCs in Europe during 1985, nearly a 50 percent increase over 1984's total sales of 163,000 units. Observers note that 88 percent of these machines are bound for corporations. IBM's growing strength is all the more impressive in light of CPM's popularity in Europe.

To ensure an ample supply of PC software, IBM has established a plan to help distribute programs developed by European companies. Under the Vendor Logo Software Agreement, IBM uses its dealer network to promote selected programs that carry the developer's logo, not IBM's.

IBM is also taking the long view, placing PCs in schools throughout Europe. The company has donated some 800 machines to more than 100 schools in Germany, Italy, the Netherlands, Spain, Sweden, and Britain. As in the United States, IBM backs its donations with teacher training.

The American Foothold

Where IBM goes, a host of other American manufacturers are sure to follow. At present, products from American computer vendors are outselling their counterparts in Europe chiefly because the U.S.-based firms have managed to export their substantial marketing, service, and support expertise along with their hardware and software. (See Table 2 for a summary of sales revenues for the leading American and European personal computer manufacturers.) The computer industry trade show, that ubiquitous symbol of high-tech America, has clearly caught on in Europe, as the Hannover Faire and COMDEX Europe demonstrate with a flourish.

The numbers confirm IBM's swift emergence as a leader in the European personal computer market.

Although many are lured by the obvious potential of the European marketplace, most American companies must meet stringent requirements before establishing a foothold in Europe, and relatively few have gained entrée to that market easily. Among those that are in, Osborne Computer and Victor Technologies (now a wholly owned subsidiary of the Swedish firm Datatronic A.B.) have emerged from the Dark Ages of Chapter 11 into a latter-day Renaissance.

Distribution channels are tight throughout the Continent, and retail shelf space for a burgeoning array of products remains limited. Stiff import tariffs also tend to deter American companies from breaking into the European scene. Some American firms have resolved these distribution and tariff tangles by establishing European-based operations. A few companies, IBM included, have pockets deep enough to set up their own manufacturing plants and retail outlets. The European welcome to that approach is warming; through reliance on

Table 2: 1984 European sales of all personal computer products and services (dollars in millions)

U.S.-based companies	
IBM	$ 2074
Apple	279
Tandy/Radio Shack	127
Hewlett-Packard	199
Digital Equipment	148
Other	1101
Subtotal	$ 3928
Europe-based companies	
Olivetti	$ 1864
Triumph-Adler	322
Philips	403
Other	44
Subtotal	$ 2633

Source: InfoCorp, Cupertino, California

various financial inducements, a few countries are now saying, in effect, "If you set up shop here, you're free to compete."

Britain is a prime locale for American companies interested in targeting the European market. IBM assembles its PC products in Greenock, Scotland, for distribution throughout Europe. AST Research of Irvine, California, which makes a variety of plug-in boards for the PC, recently established sales, support, and distribution offices in Worcestershire, England.

Ireland offers attractive incentives to foreign firms, including a low 10 percent corporate tax on manufactured goods (guaranteed through the year 2000) and a 100 percent depreciation allowance. Not surprisingly, American dollars now make up half the high-tech foreign investment in Ireland. Lotus Development is building a software duplication plant in Dublin that will also handle worldwide product distribution, and MicroPro International's major European manufacturing effort also calls Ireland home.

The Netherlands too is vying for investment dollars from American high-tech firms. The Dutch government offers companies generous research subsidies, the only proviso being that the resulting product is manufactured at least partially on Dutch soil. Various grants, loans, and tax breaks are also available. ITT has taken the Netherlands up on its offer, basing ITT's principal European distribution point in that country.

Meeting the Locals

If certain countries are clamoring for product development facilities, manufacturers are finding that existing products must be tailored to the specific needs of a diverse European market. Although unmodified versions of many American software offerings have been marketed in Europe for some time, U.S. companies now recognize the necessity of "localizing" products. Localization involves modifying products for specific audiences—from redesigning keyboards and video interfaces to making changes in character sets and screen graphics and providing full translations of manuals.

International Products Ltd. (IPL), a European IBM subsidiary responsible for marketing and modifying Entry Systems Division products, has developed PC keyboards for use in Britain, Germany, France, Italy, Denmark, Norway, Spain, Sweden, and Finland. IPL also translates system software and product documentation for each language. PC power supplies are produced to meet each country's requirements. For the IBM Portable PC and the PC AT, no retrofit is required; both are factory-equipped with dual power supplies. As part of its localization responsibility, IPL ensures that every IBM personal computer product meets the safety and power requirements of its potential destination.

Thanks to MicroPro's localization efforts, you can buy *WordStar* in any of nine languages. The European versions contain the same program code and menu formats; information screens and manuals are simply translated.

MicroPro has done well in Europe. The company's European sales of *WordStar* constitute a very respectable 20 percent of its total worldwide. Frank Frost, MicroPro's international operations vice president, notes that the company experienced a 250 percent rise in European sales from 1983 to 1984, substantially better than its 53 percent growth in the U.S. during the same period.

Microsoft has also hit pay dirt abroad. The company saw 1984 European sales increase tenfold over those of the previous fiscal year, according to Carl Stork, the company's European business development manager. Microsoft's elaborate plans underscore the company's feeling that Europe is a market to be reckoned with. The firm is setting up operations in three countries, localizing software for diverse markets and supporting its products with books translated into a variety of languages.

Microsoft's software localization extends beyond translating screen text and user manuals. Products are being revamped to

accommodate different paper sizes, peripherals, character sets, and date/time formats. Mnemonic commands have been altered to fit each target market's language. Microsoft has even managed to coin new jargon when the vernacular doesn't quite fit.

Ashton-Tate, a fourth major American presence in the European software market, recently signed distribution agreements for its products in France and Italy. The company's first offering, *dBASE II*, has been on software shelves in Europe for more than two years; the new distribution arrangements add *Framework*, *dBASE III*, and *Friday!* to that inventory. International sales account for about one-fifth of Ashton-Tate's revenues.

In addition to manufacturing, distributing, and localizing products, American companies face the weighty task of marketing their wares to a discriminating public that tends to favor the home team. Cast as outsiders by some Europeans, American companies play up the "local" nature of their foreign operations and stress that they're stimulating regional economies by providing jobs and paying taxes like any European firm.

The European Answer

European computer makers have reacted vigorously to their stateside competition. One response has been to hop aboard the PC-DOS bandwagon and develop machines with some degree of PC compatibility (thus lending credence to DOS as an international standard). The list of those flattering IBM is impressive: Ing. C. Olivetti, the giant Italian concern, makes the PC-compatible M24, which AT&T labels in the States as its PC 6300; AT&T owns a chunk of Olivetti and recently extended its joint product agreement with the firm. England's Applied Computer Techniques (ACT) markets the Apricot, a sleek MS-DOS portable. Ericsson, the Swedish phone company, sells the Step One, an MS-DOS machine that the company claims runs four times faster than the PC; the highly compatible Ericsson PC, meanwhile, has made the trek across the Atlantic and continues to receive good notices as the firm plumbs the American market. And Steinmetz, Krischeke, Systemtechnik GmbH (SKS) of West Germany offers two portables that run MS-DOS, CP/M, MP/M, or Oasis.

Even the heftiest European manufacturers have had trouble expanding the European personal computer market; most face many of the same problems as do American companies. The Europeans must also confront other woes, principally an absence of the venture capital that proved so instrumental to the success of America's high-tech industry. High costs for components, some of which are subject to the same import tariffs that, ironically, were imposed to protect Europe's manufacture of computer products, are yet another barrier to PC growth.

Of all the distribution channels currently available in Europe, Olivetti and West Germany's Triumph-Adler together control about 25 percent through concession agreements that tie stores to a given manufacturer. Another 25 percent is dedicated to manufacturers operating independently. It's open season for the remaining shelf space, with European manufacturers battling American firms—and each other.

Companies like Ericsson overcome the shortage of distribution channels by opening support centers focused on developing vertical market software and providing technical support and training for dealers. Joining forces with Texas-based Tandy Corporation, ACT has formed AT ComputerWorld. Incorporating Tandy's 430 European retail stores (with plans for additional stores on the books), AT ComputerWorld stocks both ACT and Radio Shack products.

Venture capital may be hard to come by in Europe, but wily high-tech financiers are finding ways to inject cash into their industry. Some firms have chosen to go public, while others have sought American investors. Germany's US Nixdorf raised $125 million in its first public stock offering, while Tweidata AG of Munich went public in 1983 for a net of $4 million.

American companies face the weighty task of marketing their wares to a discriminating public that tends to favor the home team.

Europe's Balancing Act

Even as European companies succeed in penetrating and broadening the personal computer market, competition is expected to remain fierce. Some see the Continent's opportunity for leadership in the international personal computer business as linked to the ability of its companies to develop, apply, and sell new technologies. The *Economist* recently described Europe's high-tech manufacturing as "dangerously stable," chastised the industry for its failure to innovate, and blamed this stagnation in part on government protectionism through "mobility inhibitors" such as job security legislation, bankruptcy laws, and fragmented research and development efforts.

Accordingly, companies and countries alike are struggling to put new products on the market and thereby cut through much of the regulatory thicket. The landscape now includes cooperative ventures funded totally by European companies as well as projects backed jointly by private industry and governments. "What's holding back the Continent is translation," says ACT managing director Roger Foster. "People are quite prepared to accept new technology, and Europe is beginning to push for its own independent standard of computing."

One recent arrangement brought together six European hardware manufacturers that collectively endorsed the UNIX operating system (thereby issuing a mild rebuff to IBM). In this case, computers from the six–ICL, Nixdorf, Olivetti, Siemens, Philips, and Bull–will be able to share data painlessly.

More critical is an undertaking by the European Economic Community (EEC). The EEC is overseeing an ambitious scheme to make Europe a major contender in the high-tech sweepstakes. The project is known as Esprit, an acronym for European Strategic Program for Research and Development in Information Technology. Participants may hail from any EEC member nation and can include European subsidiaries of multinationals; indeed, IBM Germany is nominally participating in Esprit. The venture aims to advance European R&D in five major high-technology areas: microelectronics, advanced information processing, software technology, office information systems, and computer-integrated manufacturing. Esprit plans to spend $1.3 billion by 1989 to elevate Europe's competitive standing in high technology. It is, in a sense, a response to the American enterprise known as MCC (see "Thinking Big on Silicon Prairie," *PCW*, April 1985).

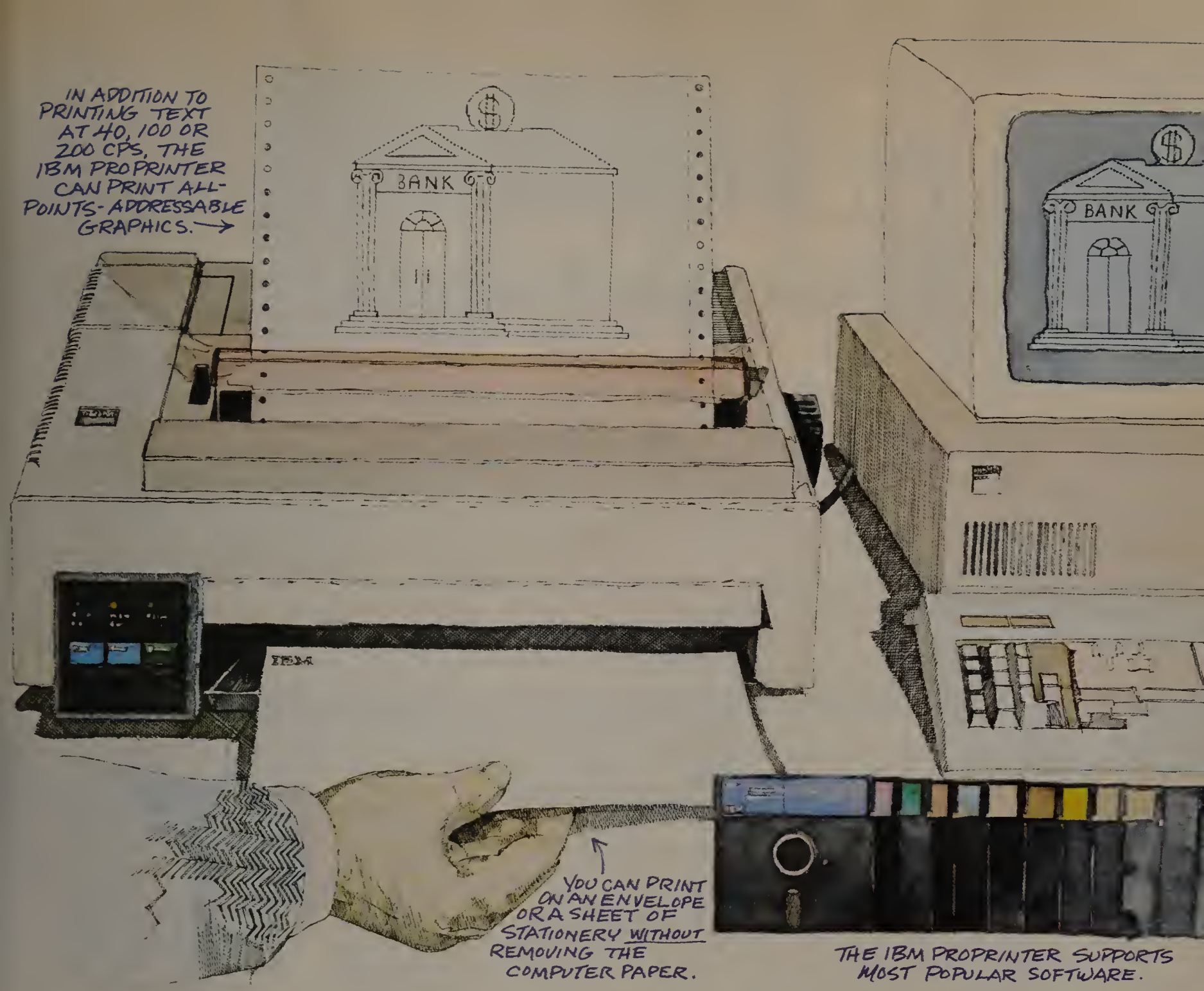
On a slightly less ambitious scale, N.V. Philips of the Netherlands and A.G. Siemens of West Germany have joined forces in the Mega Project, an effort to develop and manufacture enhanced memory chips. The companies will pool $500 million during the next five years while receiving an additional $167 million in government support. Philips and Siemens hope to apply pressure to the U.S. and Japan by producing chips for about 10 percent less than the going rate.

Siemens is also taking part in the Joint Research Institute, a private-sector project. Other participants include Campagnie des Machines of France and ICP Plc of Britain. Here, the emphasis is on exploring and implementing knowledge-based systems, a key step en route to fifth-generation computing and artificial intelligence.

Esprit plans to spend $1.3 billion by 1989 to elevate Europe's competitive standing in high technology.

All of these endeavors are part of a concerted drive by Europeans to give the Continent's stodgy, tradition-bound image some high-tech panache. If Europe proves to be half as successful producing personal computer technology as it is consuming it, time and tradition will have been no barrier at all.

Janette Martin is a Contributing Editor for PC World *and a freelance writer.*



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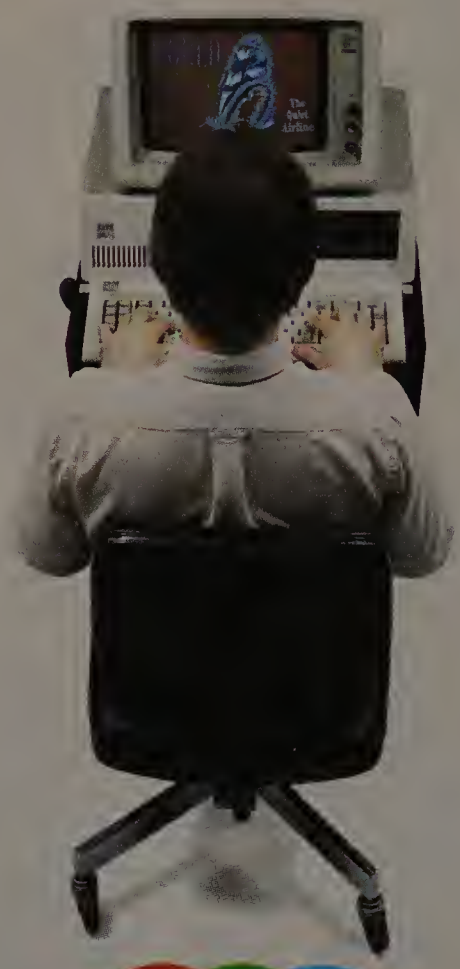

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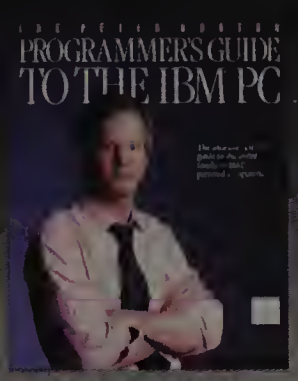

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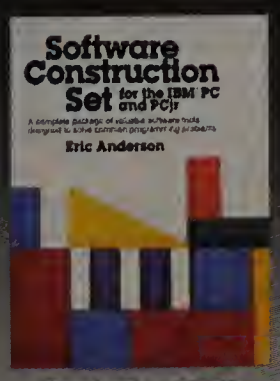

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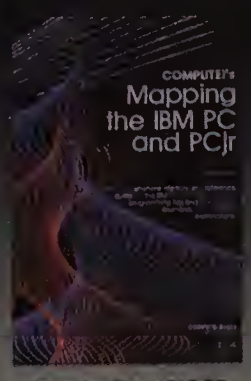

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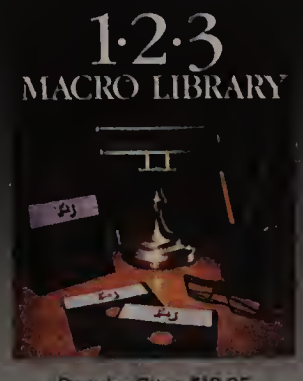

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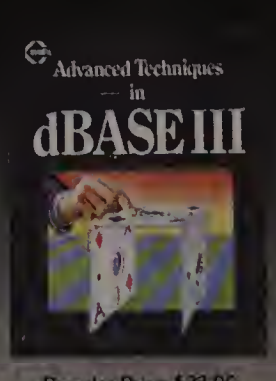

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Bill Crider

Lately I have become skeptical regarding the claims of new integrated software packages. Software companies that have tried to transplant several unrelated applications onto one worn-out body use the term *integrated* far too loosely. By their definition, Frankenstein's monster would be called an integrated man. *Ability* by Xanaro Technologies does not fall into that trap. The various applications—word processing, spreadsheet, data base management, telecommunications, presentation graphics, and DOS file management—are as smoothly coordinated as the arms and legs of an Olympic athlete.

In the last few years, certain ways of doing things have become standard in software because they work well. One of *Ability*'s strongest points is that it does the usual things in standard ways but adds original touches. As a result, I was able to sit down and begin using *Ability* immediately, without even consulting the documentation.

But common ways of doing things are not always the most intuitive for beginners. As my computer adolescence fades from memory, I have found it useful to have a novice work through programs under my observation but without my assistance. A novice perspective is especially helpful when evaluating a package such as *Ability*, which is targeted for beginners rather than power users.

I had an ideal guinea pig. My novice friend had never used a computer and had no idea how to turn on an IBM PC. If he could use *Ability*, anyone could (see the sidebar "A Novice's Perspective").

From the Beginning

Ability comes in an extravagantly designed plastic case held together with six screws and embossed with the company logo and an image of a disk. Although the artistry is impressive, a simple binder would have sufficed and might have reduced the price by $10 or $15.

Ability is not copy protected and is quite easy to install. If you have more than the required 256K, you can speed up the program by copying a special CONFIG.SYS file onto your root directory. However, the manual does not warn you that you will delete

your current CONFIG.SYS file in the process. To avoid deleting the file, see *The Help Screen* in this issue.

The package comes with an interactive disk-based tutorial that includes realistic, functional examples. The tutorial allows you to make mistakes but immediately notifies you when you do. Because of *Ability*'s voluminous help screens, advanced users may not need the tutorial in order to learn the program. Xanaro also provides a customer service phone line, but it does not have an 800 number.

The documentation is refreshingly brief, consisting of a one-page flier ("What to Do First") and a clearly written 200-page manual. The manual contains a tutorial for each application and only one chapter of reference notes. Although the attempt at succinctness is laudable, a more complete reference section would be helpful–for example, a menu tree showing the relationships of all the menus.

The Library

When you start *Ability,* you see a large-type introductory screen that lists the five major applications. Selecting any of these brings you to the Library screen. Not only is the opening screen useless, since applications are chosen from the Library, but the enormous type creates an erroneous impression of simplemindedness. Business executives want easy-to-use software, but they may be embarrassed to load a program that looks like a kindergartener's educational game.

The Library is the core of *Ability* (see Screen 1). The first five columns list the data files belonging to each application, the sixth lists other programs in *Ability*'s directory, and the seventh lists other data files not belonging to *Ability.* To choose an application and open a related data file, point to the file with the cursor and press <Enter>.

Function key assignments appear at the bottom of the screen when applicable. The function keys operate consistently throughout the program: For example, pressing <F2> brings up a line menu whose selections change depending on what application you're in. You select an item with a cursor key or by typing the first letter. Most of the selections have submenus of their own.

In the Library, pressing <F2> brings up a row of DOS commands for changing the drive or directory; erasing, renaming, and copying files; and displaying file statistics. You can even "Put-away" all the files in memory, à la *Framework.*

Selecting Other brings up a submenu with several useful features not found in most programs. The Macro selection allows you to easily create up to 30 macros and assign them to the <Alt>, <Shift>, and <Ctrl> keys. The macros can record any sequence of up to 250 keystrokes, including the function and cursor keys. Notably lacking is the ability to call macros from within other macros.

On the Devices menu you can change the defaults for devices connected to your computer, such as printers, modems, and plotters. You can print files from the Print menu or from within their applications. One unique feature enables you to print documents sideways using a dot matrix printer. Other selections let you run external programs and exit to DOS without closing *Ability.*

Flipping and Linking

Ability lacks the windows of its famous competitors, but its Flip command allows you to have two files open simultaneously. Pressing <F9> flips the display from the primary screen to the flip screen and vice versa. This is handy for comparing two documents or swapping information between documents.

To move text, data, or graphs, you open both the primary and target files, use <F7> to shade the section you want to move, pick it up with <F5>, flip to the other screen with <F9>, and put it back down with <F6>. The original is left intact. The Put-down

function also serves as an "undelete": *Ability* remembers the most recently deleted shaded item and puts it back down anywhere you want. However, the undelete does not work for characters deleted individually with <Del> or <Backspace>.

Along with providing consistent function keys and file flipping, *Ability* achieves tight integration between applications with its dynamic linking of fields. A field is like a minispreadsheet composed of just one cell. You can type formulas in directly or call information from linked fields or spreadsheets.

For example, with the mail merge facility you introduce fields into the word processor to define the variable information in the form letter. You print the mail merge letters at the other side of the link in the data base application. You can also link a spreadsheet to a numerical field in a letter so that each time the spreadsheet is updated, the corresponding figures in the letter change automatically.

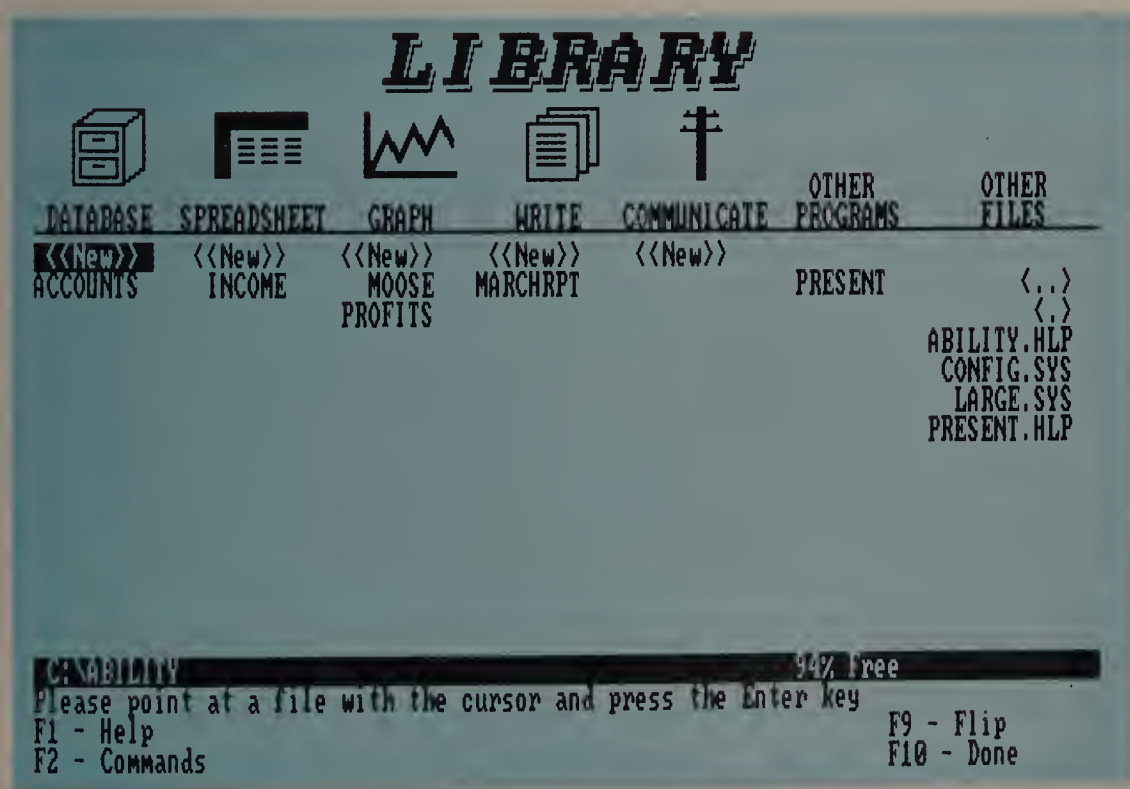
When you load a spreadsheet into a word processing document, you are working with the actual spreadsheet, not a copy. Unless you specify otherwise, any changes you make to the spreadsheet while in the word processor will be reflected in the original. If you want, you can also create a spreadsheet from scratch in the middle of the word processing document.

None of these features is revolutionary; variations of copying, flipping, and linking occur in other software packages. Yet *Ability* has implemented these standard integration features in a useful, understandable way and has added its own variations with care and restraint. The result is a sophisticated package that can be easily learned.

Word Processing

Ability's word processing module emulates page-oriented dedicated word processors. Like Wang, the program is normally in overstrike mode; to insert text, press <Ins>, and the lines below the cursor drop down a line. *Ability* uses the standard cursor key combinations, such as <Ctrl>-<CursorRight> to move a word to the right and <Ctrl>-<Home> to move to the top of the document.

Each page is surrounded by a thick, shaded border, which may help some users visualize the page but may make others claustrophobic (see Screen 2). Pressing <F2> brings up a line menu of selections, including margin control, centering, setting tabs, and creating headers and footers. You can include a date function in a header linked to the system clock so the



Screen 1: The Library is the starting point for each Ability application.

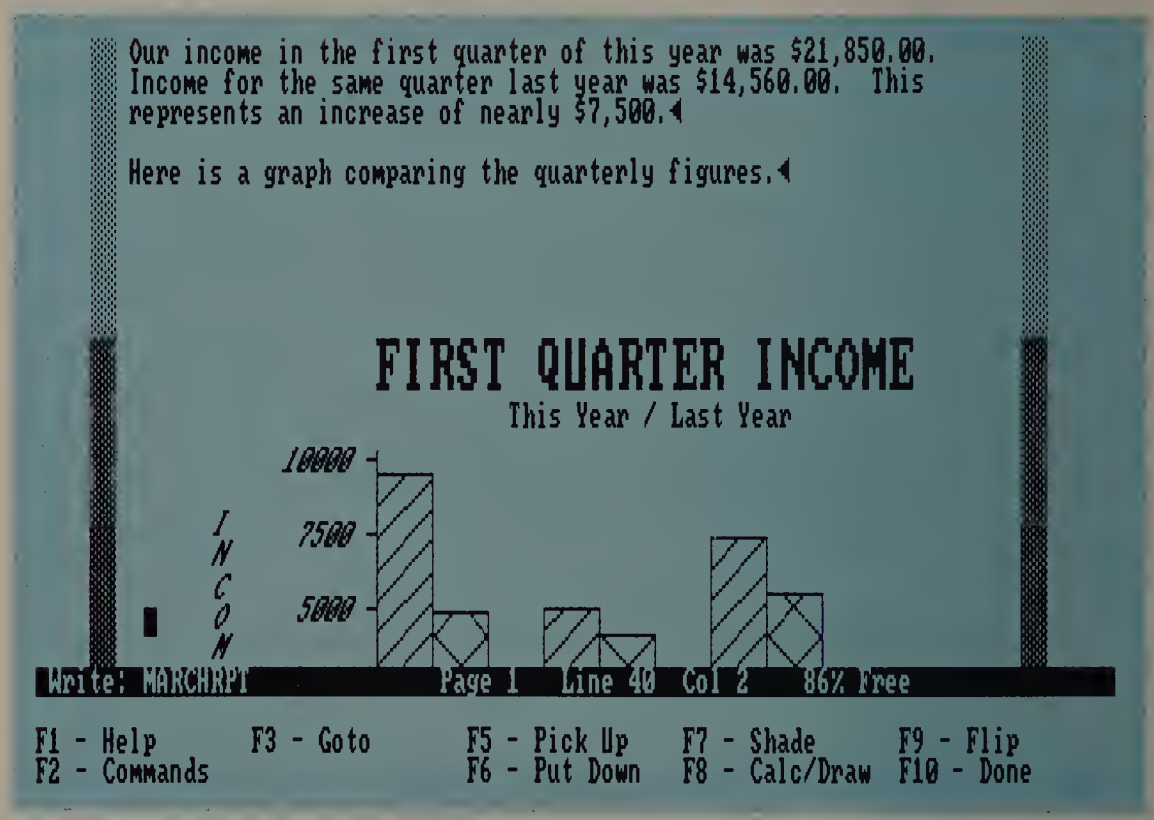
document will automatically display the current date. If you have a graphics display, the screen will show any italics, underlining, and boldface. Pressing <F3> brings up a sophisticated array of search and replace options, including wild-card and case-sensitive searching.

The best feature of the word processor is its ability to establish links with other applications and include spreadsheets and graphs. Its worst feature is the rather slow screen response, especially during word wrapping and scrolling.

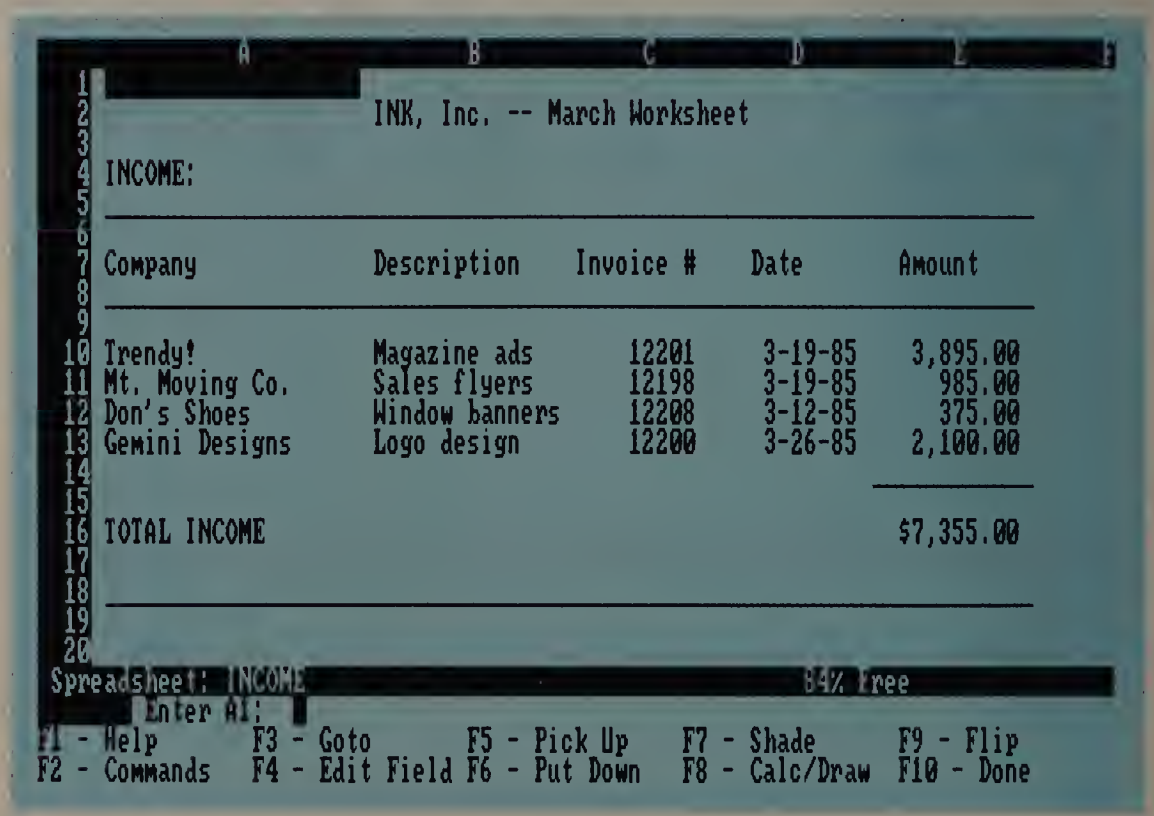
Word processing dinosaurs take note: *Ability*'s word processor loads *WordStar* files directly, converting the coding in the process. The word processor also accepts and creates ASCII files.

Spreadsheet

Ability's spreadsheet is more than three times as large as *Symphony*'s, permitting 9999 rows and 702 columns, for a total of 7 million cells (see Screen 3). But comparisons of spreadsheets based on size make no sense beyond 1 million cells. Not even an AT has enough memory to support a spreadsheet larger



Screen 2: The Ability word processor can insert spreadsheets and graphs in documents.



Screen 3: Ability's spreadsheets can be linked to any application in the package.

than that. Personally, I prefer to link several small worksheets. They are more manageable, load and recalculate faster, and are less subject to 'Out of Memory' and 'Disk Full' messages. But whether you like them big and independent or small and linked, *Ability* can handle them.

More important than size, *Ability*'s spreadsheet possesses almost all the features of *1-2-3* and other advanced spreadsheets. And with the small spreadsheets I use, *Ability*'s speed compares favorably to Lotus products.

Lotus DIF files can be loaded with relative ease. Since it is a DIF interchange, only the labels and current cell values are exchanged, not the formulas or macros. *Ability* files can also be exported to Lotus programs, but with similar restrictions on functions and formulas.

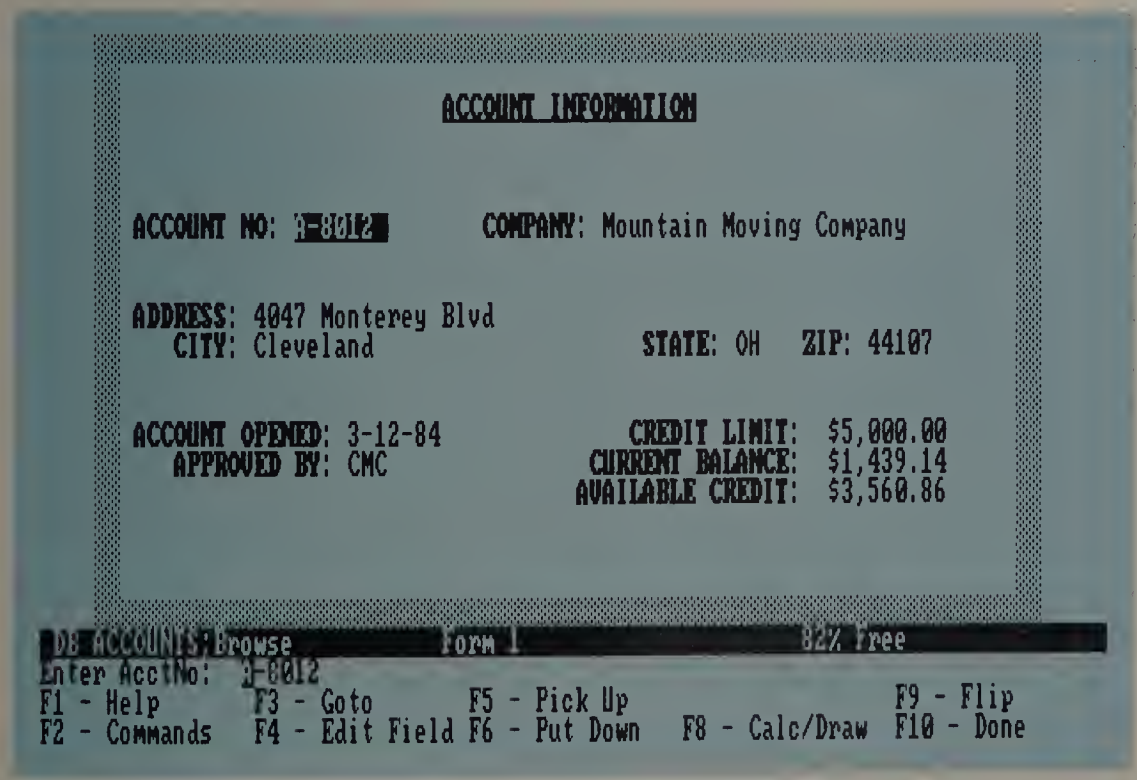
Each *Ability* spreadsheet cell can include one- and two-way links. That is, the value of a cell can depend on another cell, or two cells can depend on each other so if you enter a value into one, it will be entered into both. This process is similar to circular reference, not usually possible in spreadsheets.

Data Base Management

The *Ability* data base management system (DBMS) is form oriented, similar to the card-file approach of *pfs:file* (see Screen 4). Fields are limited to 75 characters, and field names to 13 characters. No command language is provided for tailoring applications.

To design a form, you type descriptive information and then specify field location and size. You can search for any record using any criteria on any field, including logical AND, OR, and NOT operators. Creating a working subset is similar, but you start with the subset command instead of the search command.

Because the data base is form oriented, you can't change the data while it's in a column format. You can view the data base by creating a columnar report and previewing it on the screen, but you won't be able to modify it in that format. To create a column-oriented report, you indicate the order in



Screen 4: The Ability data base is form oriented. The program provides no way to view and change data in a column-oriented fashion.

A Novice's Perspective

Brian McClure

As a computer innocent, I found *Ability* fairly easy to learn and use. True, I don't have any basis for comparison other than typewriters, calculators, and my own preconceptions of what a software program should do, but then again, a lot of potential *Ability* users may share my perspective.

The tutorial was helpful, but I was disappointed with its frequent statement, 'I can't show you all there is about . . . ' Why not? I would have been happy to take time to learn about some of the more advanced topics. Time and again, the tutorial left me hanging just when things were getting interesting.

I found the first program screen somewhat confusing. I expected to go directly to the word processor if I chose it from the menu, but I kept finding myself in the Library. I assumed I was doing something wrong but subsequently found out I wasn't.

The Library screen itself is well designed and provides a good overview of the whole package. I like being able to copy, erase, and rename files without having to go to DOS, and I appreciate the consistent operation of the function keys.

The first time I flipped the screen I feared I had lost my file. Once I understood what had happened, I realized that the Flip function could be useful for moving paragraphs from one letter to another.

The best thing about the word processor is that what you see on the screen is similar to what prints out on paper. If you have a graphics system, any italics, underlining, and boldfacing show up on the screen. The program also puts a border around each page so you can see exactly where each element will appear on the finished document; I would have had a hard time visualizing it otherwise.

I was surprised to find I could include a graph in the middle of a letter, a capability that helps to get a point across. With the word processor I could add labels and text not available in the Graph module. What really surprised me, though, was that a document linked to a spreadsheet is not static. When I changed the spreadsheet the graph depended on, the graph in the letter changed too. I eventually discovered I could turn off that function so I could keep the graph intact even when I changed the spreadsheet. This made the graph more valuable for "what-if" comparisons.

The same principle applied to the date command I used in the header of a letter. When I looked at the letter on screen a few days later, the header had changed to the current date. If you want the date to remain the same, type it in as text.

The telecommunications module proved less intimidating than expected. I don't understand communications terms like *parity* and *duplex*, but I had no trouble calling a local bulletin board and leaving some messages. I had more trouble understanding what went on at the bulletin board than I did with *Ability*'s communications module. Next I'm going to call CompuServe and The Source. I don't know what they do, but I plan to find out.

Brian McClure is a salesman in Tucson, Arizona.

which the fields will appear on the printed report and provide a heading for each column. You can also enter a code to tell *Ability* to subtotal or sort on a certain field.

Creating a form-oriented report is much like defining the data base in the first place. You type whatever descriptive text you need on the screen and create fields with the same names as the fields of the data base. When you print the report, the fields will be filled with information from the data base.

Telecommunications

Ability's telecommunications module is easy to use, flexible, and better integrated than that of any other integrated program I have seen. The commands and function keys are the same as in the rest of the program, and the communications parameters are easily set and changed from a menu screen.

Ability supports the Hayes Smartmodem and compatibles. It can be used with other modems, but the auto-dial and auto-answer features may not work. The program also allows the PC to emulate VT 52 and VT 100 terminals, which means you can connect satisfactorily to a wide variety of minicomputers and mainframes. Transmission speeds of up to 9600 bits per second are available.

Presentation enables you to control the display sequence, duration, and transition type of screens in a slide-show format.

The program comes with a proprietary error-checking protocol, but it works only if you're calling another PC that's running *Ability*. The absence of the popular XMODEM protocol is a serious deficiency, which Xanaro should remedy as soon as possible.

You can write scripts for automated logon and other common tasks and use macro functions to assign them to the function keys. If the computer you are calling is also running *Ability*, you can perform unattended file transfers.

Graph and Presentation

Ability's graphics are split into two programs—a business graphics module called Graph, and a "slide-show" program called Presentation. With the Graph module you can create bar, stacked bar, line, and pie charts. You can type data into one of the seven data fields manually or you can link it to a spreadsheet. If you change the spreadsheet, the graph changes automatically.

Ability graphs are notable for their lack of color. When using a color plotter you can select the colors the plotter will use to draw the graph, but you can't alter the display colors. However, you can change the shading, choosing from ten patterns. You can also rotate a bar chart 90 degrees and explode any or all of the segments of a pie chart.

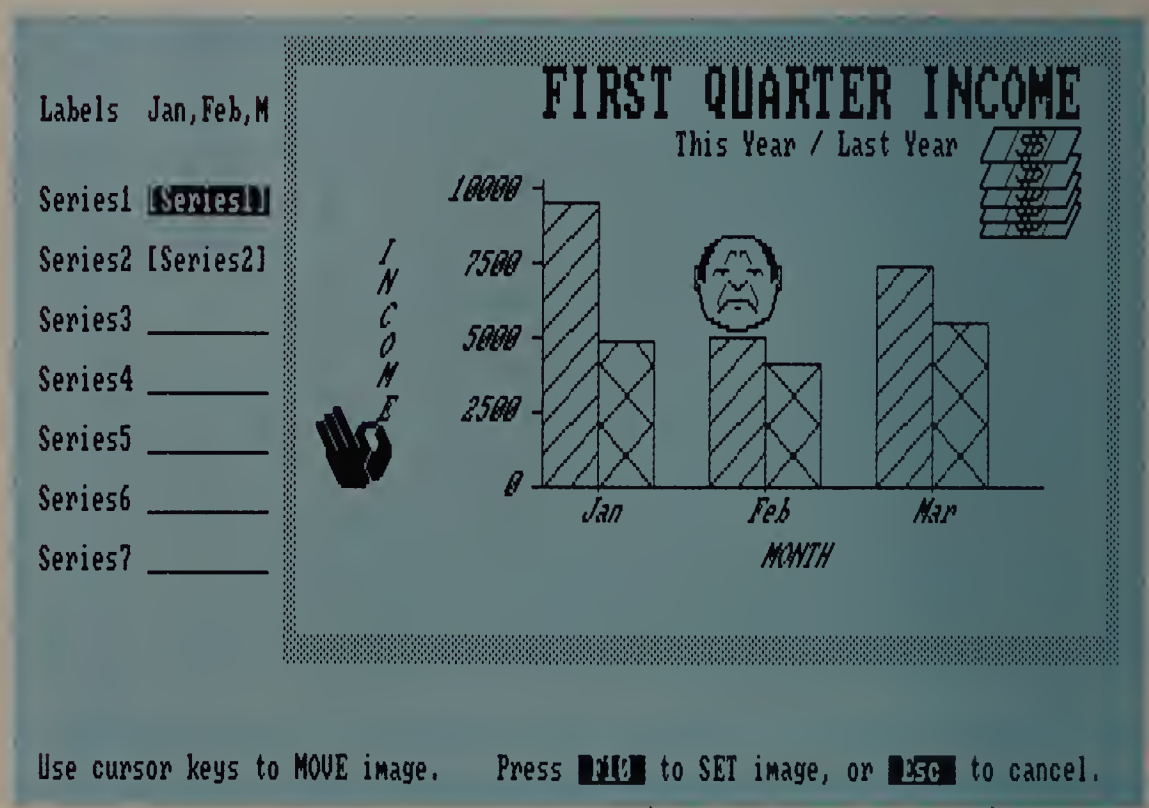
The least integrated application in *Ability* is Presentation, which requires a separate disk on a floppy-based system. Since it is not run from the Library screen, you cannot flip to it from another *Ability* application. Yet all the menus and screens are in the familiar *Ability* format, and the function keys do exactly what you would expect.

Ability allows you to take an electronic "snapshot" of any screen. Later, you can modify screen images and create an automated slide show. Once you've loaded the snapshot into Presentation, you can add text in one of seven sizes (but only one typeface), add shadowing to the text, and choose from three slant angles. You can also include symbols, such as arrows, bullets, boxes, and icons, or select one of 25 short tunes to be played when the slide appears on the screen (see Screen 5).

Presentation enables you to control the display sequence, duration, and transition type of screens in a slide-show format. *Transition* refers to the manner in which screens change. For example, transitions in Presentation include fading in from top to bottom, left to right, and diagonally.

Unfortunately, you can't add your own icons or tunes. The module would be much improved with the addition of a bit editor to allow freehand drawing and screen editing. Presentation's most limiting factor is that it does not support creative use of color—as in the rest of *Ability*, you are limited to one foreground and one background color for display.

Presentation requires a graphics monitor and an IBM-compatible color graphics board. The module wouldn't operate with a MultiDisplay color board, but it worked fine with a Hercules Color Graphics Adapter.



Screen 5: Presentation can take snapshots from any of Ability's screens and reproduce them in slide-show format.

Although Presentation's features don't compare with professional slide show products like General Parametrics Corporation's VideoShow 150 or IBM's PC Storyboard (for example, only eight transition types are available), Presentation is an attractive option not found in most integrated packages.

There You Go Again

I have yet to find a program I could not crash while performing relatively standard tasks, but *Ability* seems to go down more than most. Once I moved a graph into a letter, and when I tried to add text to it, my computer froze up. When I pressed a random combination of function keys in the Macros Help screen, my hard disk light came on, and the computer froze again. I tried in vain to reproduce both problems.

Growing Up in a Crowd

Grabbing a niche in today's integrated software marketplace is no easy task. Unsuccessful integrated programs have shown that it takes more than stitching several applications together to guarantee popularity. Xanaro has sewn together no monster, but has instead created a well-integrated, user-friendly program with negligible flaws.

Although *Ability*'s modules, most notably its word processor and spreadsheet, are more advanced than those found in the majority of integrated packages, the lack of a command language will probably keep the package from seriously challenging *Framework* and *Symphony* among power users. Yet it should be an attractive choice for the much larger group of people who thought they wanted high-end packages until they realized how time-consuming and complex such products are. *Ability*'s most remarkable quality is that it truly lives up to that worn-out phrase, "easy to use."

Bill Crider is president of the Tucson Computer Society. He is a microcomputer training consultant and a Contributing Editor for PC World.

Ability
Xanaro Technologies Inc.
321 Bloor St. E #815
Toronto, Ontario
M4W 1G9 Canada
702/322-4455
List price: $495
Requirements: 256K, two disk drives (384K, hard disk, and IBM Color/Graphics Adapter recommended)

Maximum Returns

Professional tax preparation programs for the PC have come of age. They match independent service bureau features while offering instant access and privacy. PC World examines two at the top: Tax Machine and Micro-Tax.

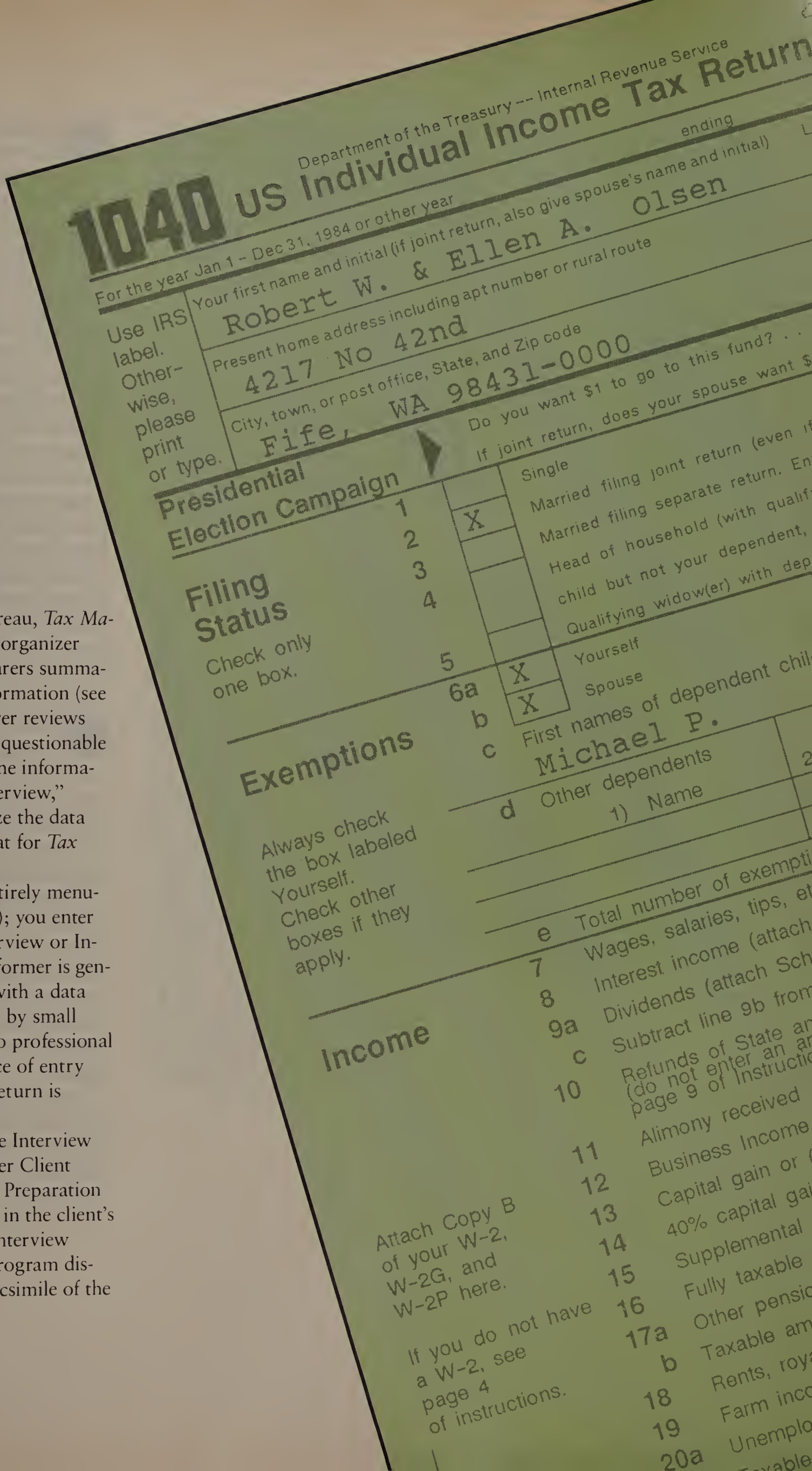
Ralph Soucie

Of all the PC applications used by accounting firms, it's surprising that tax preparation is the last to gain a foothold. In the early 1960s, mainframe-equipped service bureaus such as Fast-Tax introduced computerized tax return preparation to CPAs and other professionals. By the mid-1970s, service bureaus were as familiar as the accountant's green eyeshade. Bureaus handled noxious chores such as keypunching, printing, and collating. They provided preparers with uncomplicated questionnaires and input sheets for collecting a client's financial and tax history. Without the service bureaus, professional preparers would have spent more time generating returns and less grappling with the IRS's serpentine tax code.

PC tax programs have been around for several years, but only a handful of newcomers are beginning to seriously challenge service bureaus. The gap between programs and bureaus continues to shrink as desktop computers get faster, hard disk storage grows cheaper, and software developers learn the golden rules of customer support.

Two prominent professional tax packages scrutinized here are *Tax Machine* from Accountants Microsystems, Inc. (AMI), of Bellevue, Washington, and *Micro-Tax* from Fast-Tax of Carrollton, Texas. Both packages are sculpted for professional tax preparers who churn out at least 100 moderately complex returns a year. Both mirror the service bureau approach to gathering and entering data, incorporate tax tables and formulas for computing taxes, transfer calculations automatically between related tax forms, and print a multitude of forms and schedules (see Figure 1). Keep in mind that *Tax Machine* and *Micro-Tax* are designed only for tax preparation, not tax planning and analysis. Both AMI and Fast-Tax offer optional planning modules as well as some state income tax modules. (*Tax Machine* covers ten states; *Micro-Tax* covers 27 states and Washington, D.C.)

1984 versions of both programs were tested on an IBM PC with a 20MB external hard disk drive. *Tax Machine* requires at least a 10MB drive (AMI recommends 20MB); *Micro-Tax* will run on a dual-floppy system. Given the latter's girth (over 600K of program code) and penchant for frequent disk access, a hard disk is strongly recommended.



Tax Machine

Like a tax service bureau, *Tax Machine* provides paper organizer forms that help preparers summarize a client's tax information (see Figure 2). The preparer reviews these forms, resolves questionable items, and transfers the information to input, or "interview," sheets, which organize the data into the proper format for *Tax Machine*.

The program is entirely menu-driven (see Screen 1a); you enter data in either an Interview or Interactive mode. The former is generally used by firms with a data entry staff, the latter, by small firms with one or two professional preparers. Your choice of entry mode for any given return is permanent.

To enter data in the Interview mode, you select Enter Client Data from the Client Preparation menu. You then type in the client's Social Security and interview sheet numbers; the program displays an electronic facsimile of the

Form 1040
Form 1040A
Form 1040ES
Schedule A
Schedule B
Schedule C
Schedule D
Schedule E
Schedule F
Schedule G
Schedule R
Schedule SE
Schedule W
Form 1116
Form 2106
Form 2119
Form 2210
Form 2210F*
Form 2441
Form 3468
Form 3800
Form 3903
Form 4136
Form 4137
Form 4255
Form 4562
Form 4684*
Form 4797
Form 4835
Form 4952
Form 4972
Form 5695
Form 6251
Form 6252
*Tax Machine only

Figure 1: Federal tax forms prepared by Tax Machine and Micro-Tax

sheet for data entry. Once you've completed all the sheets, the program processes the entire batch—much as its mainframe cousins would.

In Interactive mode, you enter data directly from organizer sheets. The program's data entry screen (see Screen 2) remains the same, but after you complete a form or schedule, a filled-in facsimile of the appropriate IRS form appears on screen.

Regardless of the entry mode, *Tax Machine* accepts more data than a standard tax form permits. When the program prints the return, it generates supporting schedules to hold the overflow and references them to the appropriate forms.

Tax Machine is skilled at eliminating redundancies and flagging input errors. For example, previously entered information forces the cursor to skip inappropriate fields. You can also use proof totals (all numeric entries, including dates) to flag entry errors. *Yes* and *no* entries are also checked.

Tax Machine offers one feature many service bureaus don't. The Form 4562 input screens, which are used to enter fixed asset information, can also record fixed asset dispositions. You simply enter *Y* to flag the item and indicate the sale price and the date. The information is transferred to Forms 4797, 4255, or 6252 wherever applicable.

Returns in Hand

Tax Machine can process a single form or schedule, a single return, or a batch of returns. Computing time varies with a return's complexity, but you can expect to wait from 7 to 10 minutes per return.

As it processes, *Tax Machine* creates a diagnostic message file for each return. Most messages point out the obvious ('Beginning to process form 1040'), but some supply vital information about missing data, improper use of a depreciation method, and so on. Be prepared to sift through the file for these informative nuggets; error messages are mixed in with the dross. After computation, a condensed version of the completed 1040 and Schedule A forms is available for on-screen review.

Powerful Printing

You can print the results of *Tax Machine*'s ministrations on official IRS forms or on blank paper, which you can photocopy with acetate overlays; you can also generate facsimiles. In the latter case, *Tax Machine* wisely supports the Hewlett-Packard LaserJet printer. Instead of completing a blank form or merging a printout with an overlay, a laser printer simultaneously generates IRS-approved forms and their data (see Figure 3).

Once a return is prepared, *Tax Machine* can produce *pro forma* organizer and input sheets for next year's returns, along with personalized client instruction letters. *Tax Machine* will even carry

over prior-year client data for a second year. Depreciation data is the exception, but AMI plans to remedy this by the end of 1985.

Two to Learn By

AMI's dedication to user training is first-rate. *Tax Machine*'s price tag covers a videotape tutorial, plus a one-day seminar for your staff at one of six training centers in New Jersey, Florida, Illinois, Texas, California, and Washington. User manuals are geared to everyone in the preparation process: system operator/clerk, administrator, preparer using Interactive mode, and preparer using Interview mode. The manuals are clearly written and liberally sprinkled with flowcharts illustrating *Tax Machine*'s structure. Clarifications and cautions for each federal tax form are also included. The documentation can be faulted, however, for lacking an index of error messages.

Expensive Support

Though *Tax Machine* comes with every learning aid imaginable, a time will undoubtedly come when you have to pick up the phone and call for the cavalry. Your first howl for help is free—if it's related to installing the program. Subsequent queries run a stiff $1 per minute—note that the minimum charge is for 10 minutes. The company plans to offer unlimited phone consultation in 1986 for an as yet undisclosed fee. Considering the program's complexity,

```
AMI TAX MACHINE                    "Your Firm Name (30 chars)"
2.0 Client Return Preparation

                    Client ID     [223-900_]

          1. Allocate Form(s) ................. [_____]

          2. Enter Client Data ................ [_____]

          3. Compute Client Form(s) ........... [_____]

          4. Compute Form(s) at end of session . [___]

          5. Compute and Print at end of session [___]

          6. Deallocate a Form ................ [_____]

Press (backspace) to return to Tax Machine Menu.
```

```
          * * * * * MICRO-TAX SYSTEM DIRECTORY * * * * *
            (c) 1978-84 Microcomputer Taxsystems, Inc.

                          1984 SILVER

                THE FOLLOWING FUNCTIONS ARE AVAILABLE:

 1  CREATE NEW FILES FOR CLIENT          11  INITIALIZE NEW CLIENT DISK
 2  SELECT SCHEDULES AND FORMS           12  LIST CLIENTS ON FILE
 3  DISPLAY ACCOUNT STATUS               13  ACTIVATE ANOTHER CLIENT
 4  PRINT QUESTIONNAIRE                  14  COPY CLIENT FILES
 5  ENTER DATA                           15  DELETE CLIENT FILES
 6  COMPUTE TAX                          16  EXIT TO OTHER TAX SYSTEMS
 7  DISPLAY RECAP                        17  EXIT TO TAX ORGANIZER
 8  PRINT TAX FORMS                      18  LOAD SALES TAX TABLE
 9  DEPRECIATION MODULE                  19  TAX-NET SYSTEM UPDATE
10  BATCH COMPUTE/PRINT                  20  SET SYSTEM SPECIFICATIONS

                      EJ  EXIT FROM SYSTEM

                  PLEASE ENTER FUNCTION NUMBER _
```

Screens 1a and 1b: Tax Machine's Client Return Preparation submenu (top) and Micro-Tax's 20-command main menu (bottom).

first-year users should make the investment.

Keep in mind that *Tax Machine* is not sold like an appliance but is actually licensed to users. First-time buyers pay $1495; program updates, which include system enhancements and reflect changes in the tax laws and tables, cost $900 per year or $225 per quarter.

Taxing Problems

Tax Machine's biggest plus is its ability to calculate and transfer most figures automatically from one form to the appropriate lines in others. The few exceptions, however, are potential sources of error. For example, *Tax Machine* will compute the bottom line for Form 4952 (allowable investment interest), but you must then enter that figure manually in Schedule A. For an installment sale of depreciable personal property, it is easy to mistakenly enter prior depreciation in the wrong field. *Tax Machine* will not flag either of those errors. It's easy enough to sidestep these little traps, but you have to watch out for them.

Micro-Tax

Micro-Tax comes in three versions: Bronze, a low-cost issue that handles only the essential tax schedules; Silver, which prepares complex returns (and is the subject of this evaluation); and Gold, which is Silver modified to support the Canon Formwriter II laser printer. Installing the program takes about 10 minutes and includes establishing system configuration and preferred printing specifications.

Like *Tax Machine*, *Micro-Tax* is menu-driven (see Screen 1b). The main menu lists 20 functions; submenus aplenty expand on these selections. For example, after you enter all client data, one submenu option offers to load the tax computation module.

Micro-Tax can print out questionnaires, which serve as both client data organizers and data input sheets (see Figure 2). A better option is to obtain preprinted organizers (available from third-party suppliers) for clients and to use the questionnaires as input sheets. *Micro-Tax* asks for one entry at a time, each prompt corresponding sequentially to line items on the client questionnaire. *Micro-Tax* repeats that process for each form or schedule until the entire return is completed.

Each client is assigned a 3-digit code—a step *Tax Machine* eliminates by logical use of Social Security numbers. Normally, you select all of a client's tax forms and schedules from the main menu before entering data. Fortunately, you can select additional forms as needed if you're hip-deep in a Form 1040 input screen.

Micro-Tax does not compute results as each form or schedule is completed but processes the entire return (or group of returns) in one gulp. Nor does the program make use of the PC's <PgUp> and <PgDn> keys. Like *Tax Machine*, *Micro-Tax* skips inapplicable input lines based on previous entries and accepts proof totals. But other obstacles await, for *Micro-Tax* obliges you to specify which forms and schedules in a return are interdependent. For example, *Micro-Tax* will compute the alternative minimum tax only if Form 6251 has been selected.

Impressive Printing

Micro-Tax prints individual forms, single returns, and entire batches on IRS forms, via laser-generated facsimiles (in the Gold version of the program) or using overlays. Unfortunately, you can select print specifications "on the fly" only in batch-print mode. In all other instances, you must return to the main menu, open the system specifications file, and change specifications before continuing.

Like *Tax Machine*, *Micro-Tax* produces customized client instruction letters and questionnaires that reflect the previous year's tax information.

On-the-Shelf Help

Micro-Tax's user manual is illustrated and concise and includes an index of error messages. Fast-Tax provides free telephone support 11 hours per day, five days a week during January and February; from March 1 through April 15, the company extends support to 13 hours on weekdays, 9 hours on Saturdays, and 6 hours on Sundays. You can telecommunicate questions and receive answers (as well as program updates) via The Source.

```
AMI TAX MACHINE                          "Your Firm Name (30 chars)"
Form: 1040H $1 ENTER MODE                Z/Fidelity Ltd.

Filing Status - enter number [ ]                      Preparer's initials [___]
  1 -  Single                          Forced ID [_]
  2 -  Married - joint return.
  3 -  Married - separate return.   Lived with spouse ..... [N]   Forced ID [N]
  4 -  Head of household.   Unmarried child's name [_________________________]
  5 -  Qualifying widow/er with dependent child ........... Spouse died 19[__]

Names as shown on 1040 ... [_________________________________]

                  First Name        Last Name                    SSN
Payer's name .... [_______________] [_______________]          [___-__-____]
Spouse's name ... [_______________] [_______________]          [___-__-____]

Street Address .. [_________________________________]  Phone ..[___-___-____]
City [_______________]  County [_______________]  State [__]  Zip [_________]

Occupation [___________________]    Spouse's Occupation [___________________]
$1 to go to Presidential Election Campaign .......... Payer [N]      Spouse [_]
              State return to be computed ................. [N]
```

Screen 2: A Tax Machine on-screen data entry form

TAX INFORMATION ORGANIZER

WILLIAM J AND JUDY V ABERNATHY	514-49-7931		PAGE 8
DESCRIPTION	PSJ*	CURRENT YEAR	LAST YEAR
ITEMIZED DEDUCTIONS CON'T.			
INTEREST EXPENSE			
HOME MORTGAGE			8,360
MORTGAGE PAID TO PRIVATE PARTY?			YES - NO
CREDIT AND CHARGE CARDS			145
AUTOS			
ABC CREDIT LOAN			217
FIRST STATE BANK			175

```
                TAX DATA QUESTIONNAIRE - 010 - SPATS & ZORMA CAVANAUGH

                 A            ITEMIZED DEDUCTIONS
-------------------------------------------------------------------------------
 33  CASH CONTRIBUTIONS UNDER $3000          _____________________________  33

     CONTRIBUTIONS $3000 OR MORE

 35  ORGANIZATION                      # 1 _____________________________  35
 36  AMOUNT                            # 1 _____________________________  36

     CONTRIBUTIONS OTHER THAN CASH

 38  ORGANIZATION                      # 1 _____________________________  38
 39  PROPERTY DESCRIPTION              # 1 _____________________________  39
 40  DATE ACQUIRED                     # 1 _____________________________  40
 41  DATE CONTRIBUTED                  # 1 _____________________________  41
 42  COST OR BASIS                     # 1 _____________________________  42
 43  DEDUCTION AMOUNT (FMV)            # 1 _____________________________  43

 44  CARRYOVER FROM PRIOR YEARS              _____________________________  44

     CASUALTY AND THEFT LOSSES
```

Figure 2: Sample sections from Tax Machine's client information organizer and Micro-Tax's client questionnaire. Data from the organizer is summarized and transferred to input sheets; the questionnaire serves as both organizer and input sheet.

Figure 3: A 1040 form generated by Tax Machine and Hewlett-Packard's LaserJet printer

1040 Department of the Treasury -- Internal Revenue Service
US Individual Income Tax Return 1984 (0)

For the year Jan 1 - Dec 31, 1984 or other year ending — OMB #1545-0074

Use IRS label. Otherwise, please print or type.

Your first name and initial (if joint return, also give spouse's name and initial) Last name: Robert W. & Ellen A. Olsen
Your Social Security No: 537 89 8957
Present home address including apt number or rural route: 4217 No 42nd
Spouse's Social Security No: 536 45 7935
City, town, or post office, State, and Zip code: Fife, WA 98431-0000
Your occupation: Professor
Spouse's occupation: Teach. Aide

Presidential Election Campaign ▶ Do you want $1 to go to this fund? Yes [ ] No [X]
If joint return, does your spouse want $1 to go to this fund. Yes [ ] No [X]
NOTE: Checking Yes will not increase your tax or reduce your refund

Filing Status — Check only one box.

For Privacy Act and Paperwork Reduction Act Notices see Instructions

1 [ ] Single
2 [X] Married filing joint return (even if only one had income)
3 [ ] Married filing separate return. Enter spouse's soc. sec. no. above and full name here
4 [ ] Head of household (with qualifying person). See page 6 of instructions. If the qualifying person is your unmarried child but not your dependent, write child's name here.
5 [ ] Qualifying widow(er) with dependent child. (Year spouse died 19 ▶).(See page 6 of Instructions.)

Exemptions — Always check the box labeled Yourself. Check other boxes if they apply.

6a [X] Yourself [ ] 65 or over [ ] Blind
b [X] Spouse [ ] 65 or over [ ] Blind
} Enter number of boxes checked on 6a and b ▶ 2
c First names of dependent children who lived with you: Michael P.
} Enter number of children on 6C ▶ 1

d Other dependents 1) Name	2) Relationship	(3)Number of months lived in your home	4Did dependent have income of $1000 or more?	(5)Did you provide more than 1/2 of dependents support?

Enter number of other dependents ▶
Add numbers entered in boxes above ▶ 3
e Total number of exemptions claimed (also complete line 36) ▶ 3

Income — Attach Copy B of your W-2, W-2G, and W-2P here. If you do not have a W-2, see page 4 of instructions. Please attach check or money order here.

7	Wages, salaries, tips, etc.	7	33,752
8	Interest income (attach Schedule B if over $400)	8	744
9a	Dividends (attach Schedule B if over $400) 575 9b Exc 200		
c	Subtract line 9b from line 9a and enter the result	9c	375
10	Refunds of State and local income taxes from worksheet on page 9 of Instructions (do not enter an amount unless you deducted those taxes in an earlier year -- see page 9 of Instructions)	10	
11	Alimony received	11	
12	Business Income or (loss) (attach Schedule C)	12	1,141
13	Capital gain or (loss) (attach Schedule D)	13	
14	40% capital gain distributions not reported on line 13 (see page 9 of Instructions)	14	
15	Supplemental gains or (losses) (attach Form 4797)	15	
16	Fully taxable pensions, IRA distributions, and annuities not reported on line 17	16	
17a	Other pensions and annuities, including rollovers. Total. 17a		
b	Taxable amount if any from worksheet on page 10 of Instructions	17b	
18	Rents, royalties, partnerships, estates, trusts, etc. (attach Schedule E)	18	
19	Farm income or (loss) (attach Schedule F)	19	
20a	Unemployment compensation (insurance). Total received. 20a		
b	Taxable amount if any from worksheet on page 10 of Instructions	20b	
21a	Social Security benefits. (see page 10 of Instructions) 21a		
b	Taxable amount if any from worksheet on page 10 of Instructions	21b	
22	Other income Washington State Lottery	22	500
23	Add lines 7 through 22. This is your TOTAL INCOME	23	36,512

Adjustments to Income (See Instructions on page 11)

24	Moving expense (attach Form 3903 or 3903F)	24		
25	Employee business expense (attach Form 2106)	25		
26a	IRA deduction, from the worksheet on page 12	26a		
b	Enter here IRA payments you made in 1985 that are in line 26a ▶			
27	Payments to a Keogh (H.R.10) retirement plan	27		
28	Penalty on early savings withdrawal of savings	28		
29	Alimony paid	29		
30	Deduction for a married couple (attach Schedule W)	30	839	
31	Add lines 24 through 30. These are your TOTAL ADJUSTMENTS			31 839

Adj Gross Income

32	Subtract line 31 from line 23. This is your Adjusted gross income. If this line is less than $10000, see "Earned Income Credit" (line 59) on page 16 of the Instructions. If you want the IRS to figure your tax, see page 12 of Instructions	32	35,673

Sample Preparer's Edition AMI Tax Machine 1985

Many Happy Returns?
Although *Tax Machine* and *Micro-Tax* perform identical tasks, the two programs differ substantially. *Micro-Tax* has severe capacity limitations: If a client's return encompasses more than 20 federal schedules or 400 data items, you must prepare excess schedules manually. And multiple occurrences of the same tax form (such as two Schedule Cs) in the same return force you to issue a different client code for each.

But the most striking difference is *Tax Machine*'s superior integration of tax forms. Based on the information you enter, the program selects the appropriate tax forms (with the exceptions noted here) and passes information among them automatically in accordance with IRS instructions. For example, entries in Form 4797 generate a Schedule D, and Schedule C income automatically conjures up a Schedule SE. You manually select a form only when it appears twice in a return.

As noted earlier, *Micro-Tax* obliges you to select all forms and schedules in advance. The program also forces you to drag out a calculator on occasion. For example, limits on earned income (IRA and Keogh deductions) must be computed manually. The program will not determine whether a gain is long-term or short-term, based on dates entered on Forms 6252 and 4797 or Schedule D. You must indicate the holding period for asset sales.

The Returns Are In
Which program is the tax-time saviour? On the whole, *Tax Machine* is more thorough and sympathetic to the user. Its documentation is superior and aimed specifically at hard disk users equipped with MS-DOS; its tutorials and classroom instruction beat *Micro-Tax*'s brief written tutorials hands down; its integration of tax forms greatly reduces manual data entry.

Of course, if ample and free phone support is vital and *Tax Machine* does not compute full returns for your state, you may find this program fatally flawed. And if you expect to prepare fewer than 120 returns, you might favor *Micro-Tax* for its significantly lower price tag.

But *Tax Machine* is easier to use, and it calculates and extensively integrates almost all forms and schedules. It requires far less attention and on the whole represents an advance in the state of the art. In the final analysis, *Tax Machine* yields a better return.

Ralph Soucie is tax manager with Kenneth M. Mitchell & Co., a CPA firm in Oregon City, Oregon.

Tax Machine
Accountants Microsystems, Inc. (AMI)
P.O. Box 50
Bellevue, WA 98009
800/426-8201, 206/643-2050
List price: federal package $1495, annual update $900. Each state package $395 (AL, IL, MI, NJ, OH, VA); $595 (OR); $795 (CA, NY, PA). Quarterly license fee (telephone support and program updates) $225 (federal); $50 (AL, IL, MI, NJ, OH, VA); $75 (OR); $100 (CA, NY, PA). Tax planning package $495. Hewlett-Packard LaserJet printer with AMI GX font cartridge $4495; GX cartridge alone $1500; laser printing software for federal forms $495.
Requirements: 256K, 10MB hard disk (20MB recommended)
Not copy protected

Micro-Tax, Silver version
Fast-Tax
2395 Midway Rd.
Carrollton, TX 75006
800/327-8829, 214/250-7000
List price: federal package $995, annual renewal $695; with laser printing capability $1195, annual renewal $1195. Each state package $350 (CT, FL, GA, HI, IA, KS, LA, MS, NE, NJ, OH, OK, OR, VA, WI); $500 (AZ, CO, DC, IL, IN, MD, MA, MI, NC, PA); $750 (CA, MN, NY); state renewals at one-third original cost. Tax planning module $295
Requirements: 96K, two disk drives
Not copy protected

A 1-2-3 Foursome

Templates package the flexibility of 1-2-3 in a spreadsheet customized for any application.

William Urschel

How do you harness the power of *1-2-3* without mastering formulas, macro commands, and other spreadsheet minutia? The answer is to use a template—a *1-2-3* spreadsheet with formulas and macros already built in.

1-2-3 is a veritable chameleon. While its heart and soul remain untouched, its outward appearance changes with each template to suit a wide range of applications. These include accounting, real estate, project management—almost anything you can think of.

Whatever the application, *1-2-3* templates are usually cheaper, simpler to use, more flexible, and often faster than programs dedicated to a specific task. Templates stretch *1-2-3* well beyond its original design, often by buttressing weak points, particularly in the area of data base management.

A template's real strength is its adaptability: you can conveniently modify it with additional macros. What's more, you can sidestep the template at any time and have *1-2-3* commands at your disposal. Not surprisingly, spreadsheet templates are among the hottest commodities in the software industry—with *1-2-3* templates representing the vast majority of the 1500 template programs now on the market.

The four templates reviewed here are outstanding examples of their respective applications and embody different levels of sophistication. *Bottomline V* aids financial decision making, *Key II* is a data base analysis tool, *CPA+* is an all-in-one accounting package, and *Stock Record/Query/Portfolio Manager* tracks stocks and performs technical analysis.

Template Tour

Templates come in three levels of sophistication. The simplest kind—in existence since the first copy of *VisiCalc* was sold—is sometimes referred to as an open matrix. What you get is a spreadsheet (the matrix) filled with interlocking formulas but without any driving macros or menus. This template design's strength lies in its elegant simplicity, but with no helpful prompts you must at least know your way around a *1-2-3* spreadsheet. *Bottomline V* falls into this category.

The other three templates reviewed are classified as semiautomated because they use the power of macros. These templates present menu options on the *1-2-3* command line, often explaining the options more fully at the center of the screen. These features serve mainly to position the cursor logically for each data entry task and to shuffle calculated results

automatically to the appropriate areas in a spreadsheet. The crucial point to remember about semi-automated templates is that they don't provide true data entry screens or entry validation; you enter data directly into individual spreadsheet cells.

A fully automated template presents a data entry screen, which isolates you completely from the spreadsheet (see "Ready-to-Run Accounting," *PCW*, September 1985). The screen prompts you for the type of data to be entered. Then the template tests the entry to make sure it's the right type. An incorrect entry, such as a letter where a number should be or an account number for a non-existent account, elicits a beep or some other prompt to try again.

After entered data is validated, the fully automated template sends the data to the correct spreadsheet cell. Because you never descend to the spreadsheet level, you need not be a *1-2-3* expert. Be forewarned: Only a small percentage of templates now on the market are fully automated, although many are labeled as such.

Bottomline V

Bottomline V is a superb open matrix template for corporate or small business managers who do financial planning, analysis, and forecasting and who are comfortable with basic *1-2-3* operations. Although it lacks menus and macros, *Bottomline V* is intuitively easy to use because what you see on the screen, whether an income statement or a balance sheet, looks exactly like the familiar printed version.

Bottomline V is a great time-saver. Using this template I recreated the basic financial state-

SALES JOURNAL

COMPANY	DATE	REFERENCE NUMBER	AMOUNT	ALLOCATION	ACCOUNT	BALANCE
			29,067.67	29,067.67		
HERCULES RADIO	01-Jun-85	1100	5,000.00	5,000.00	SALES	4,566.01
PAUL JOHNSON	01-Jun-85	1101	15,000.00	15,000.00	SALES	14,000.00
XYZ CORP	15-Jul-85	1102	3,195.00	3,000.00	30000	3,000.00
XYZ CORP	15-Jul-85	1102		195.00	SALES TAX	195.00
AMEX	19-Jul-85	1103	3,872.67	3,872.67	CREDIT SALE	3,872.67
HOWARD ELECTRONICS	20-Jul-85	1103	2,000.00	2,000.00	SALES	

Figure 1: CPA+ displays eight accounting journals plus a work area in adjacent columns within a 1-2-3 spreadsheet. Two of the eight journals—Sales (accounts receivable) and Employee Payroll—are shown here. Macros appear in columns to the right of the journals.

ments for a medium-size manufacturing company in 90 minutes, a job that had taken me two weeks working with a CPA.

To use *Bottomline V,* you begin by entering a 12-month budget, plugging all data directly into the spreadsheet. Next, you enter other pertinent data into any of the nine journals, which are located in separate sections of the spreadsheet. The journals collect information on sales forecasts, cost of sales, operating expenses, average collection period, days of inventory carried, debt funding, equity funding, capital expenditures, and research and development costs. The final step is to select *1-2-3*'s Calc function (<F5>); *Bottomline V* automatically churns through nearly 9000 calculations to produce the correct totals for each journal.

What results from these machinations are income statements, balance sheets, cash flow reports, financial ratio analyses (debt versus equity, cash versus long-term debt), one-year quarterly forecasts, five-year annual forecasts, and so on. All reports can be printed.

Anyone who's a competent bookkeeper will understand *Bottomline V* at a glance because it adheres to familiar, conservative accounting practices. For example, all depreciation is calculated using the straight-line method.

You should, however, know how to use *1-2-3* in case you need to change data or formulas. For example, you might decide to change from straight-line to ACRS depreciation. Other possible changes relate to program logic: On the projected income statement, for instance, if an asset becomes fully depreciated during the period forecast, you may have to remove the item manually—a quick, straightforward procedure that only an extremely sophisticated (translation: expensive) accounting program would do automatically. If you haven't altered formulas before, don't worry. The user manual contains detailed notes and good examples.

Key II

Key II enhances *1-2-3*'s data base function, its weakest feature, by providing six menu-driven modules that perform various data base analyses. *Key II* is exactly the sort of analysis tool a manager needs to dissect an existing data base, whether it was created by *1-2-3, dBASE II* or *III,* or any other program that can convert its data base files to ASCII format.

Key II is semiautomated, so you need not be a *1-2-3* expert to use it. The template's menus and macros run combinations of *1-2-3*'s data base commands, such as those that create criteria ranges or data tables. To make life even easier, *Key II* is accompanied by a well-organized user manual and a thorough, step-by-step tutorial disk.

```
                                        FROM:01-Jun-85
              EMPLOYEE PAYROLL JOURNAL   TO: 15-Jun-85

                                TAXABLE ITEMS     NONTAX  ITEMS          TAXES              TOTALS
     EMPLOYEE          EARNINGS   AMOUNT DESCRIP.  AMOUNT DESCRIP.   AMOUNT  DESCRIP.      AMNT. DESCRIP.
-------------------------------------------------------------------------------------------------------

JAMES JENNINGS                  REG   100.00 BONUS     0.00 LOAN       (161.01)FED        866.65 REG.
SS # 546-78-7894          86.67 HRS    50.00 OTHER     0.00 REIMBURSE   (34.61)STATE       75.00 OVER.
BIRTH - 4/4/44            10.00 RATE                 (10.00)INSURANCE   (76.96)FICA       150.00 TAXABLE
HIRE -  1/1/85                                         0.00 MISC         (6.55)SDI        (10.00)NON-TAX
TERM -                          OVER                                      0.00 LOCAL     (280.13)TAXES
RAISE - 6/1/85             5.00 HRS
SEX - M                   15.00 RATE
MARITAL STATUS - 1
EXEMPTIONS - 1
GROSS YTD              =========     =========      =========          ==========       ===========
            $5,149.95    941.65        150.00         (10.00)           (280.13)          801.52 NET PAY
```

A major disappointment is that the template only analyzes data in existing data bases; it cannot help you create a data base. *Key II* lacks a menu-driven screen to speed up manual entry or provide entry validation. The program is flexible enough that I was able to jury-rig an entry screen with *1-2-3* macros in just a few hours. I don't see why the manufacturer failed to provide such a screen.

A sales manager overseeing a nationwide operation could use *Key II*'s Inquire module—the simplest of the six—to simultaneously find the lowest and highest values and the sum, average, and number of items for as many as eight numeric fields, such as price and profit margin. Like *Key II*'s other modules, Inquire gives you the choice of printing a report, saving it to disk, graphing the results, or beginning another analysis on the same or modified data.

Other *Key II* modules perform more complex analyses. The Analyze module selects data base records that meet certain criteria and then performs basic mathematical operations on selected fields. For example, the module could sort for all salespeople who have more than 50 sales, arrange them by district, and automatically calculate the profits generated by each. Similar in function, the Extract module could pull individual sales records for each salesperson based on specific criteria, then total the numeric fields in the final report.

The Distribute module is exceptionally useful, proving that a picture is worth a thousand words, or several thousand bytes as the case may be. The module creates a two-dimensional data table, with the *x* and *y* axes representing any two fields in a record. Thus, months might be listed across the top of the table and salespeople down the left column, with each person's monthly sales inserted into the appropriate cell. The Count module simplifies use of *1-2-3*'s often neglected data distribution function, which calculates how many fields in a given range contain values that match a given criterion.

Key II also has two ancillary modules. The Report module prints a copy of a sorted data base with totals and subtotals, and adds dates and headers. The Modify module helps you add and delete records from existing data bases.

Other than the lack of a data entry screen, *Key II*'s only shortcoming is the restricted number of data base records it accommodates—a limitation imposed by *1-2-3*, which holds all data and program code entirely in RAM. Although I didn't push *Key II* to its limit, I was able to import an 8-field, 1200-record *R:base 5000* stock data base on a 512K PC

> Key II *is exactly the sort of analysis tool a manager needs to dissect an existing data base.*

without a problem. The secret to using *Key II* effectively is to initially cull records with the source data base program, reserving *Key II*'s talents for data analysis.

CPA +

If you are doing the books for a small to medium-size business, you will need at least a general ledger program and quite possibly accounts payable, accounts receivable, and payroll modules. An outstanding template that incorporates all of these functions in one trim package is *CPA +*.

One of *CPA +*'s most notable features is speed. It posts entries and runs updates many times faster than any dedicated accounting program I've used. This speed is due primarily to the placement of its eight journals (general ledger, accounts receivable, accounts payable, payroll, cash disbursements, cash receipts, general [for miscellaneous entries], and names) and a work area in adjacent columns of the spreadsheet rather than in separate modules (see Figure 1).

CPA +'s columnar format limits the number of accounts and transactions you can manipulate at once. However, the maximum number should be more than adequate for almost any small business, because a 640K PC accommodates up to 700 general ledger accounts, with 700 entries per journal per period. *CPA +* does not allow you to link spreadsheets to overcome memory limitations.

While evaluating *CPA +* I was continually surprised by the wealth and variety of features packed into its macros—the journals perform functions you would expect from dedicated accounting programs. The accounts payable journal, for instance, stores vendor name, invoice date, purchase order number, amount, allocation, account number, due date, and balance. (The names journal also stores the vendor's name, address, telephone number, and contact.) A report lists the total owed to each vendor, with an aged breakdown. *CPA +* also pays partial invoices, calculates discounts, provides automatic payment for all accounts or for selected disbursements, and prints checks.

Check printing is a bear with many accounting programs because of the difficulty of aligning checks properly in a printer. *CPA +* at least lets you print trial runs with dummy checks. You have the choice of printing checks for all open payable accounts, a selected range of dates, or a range of vendors.

The accounts receivable journal is similarly comprehensive. Each invoice records customer name, invoice date and number, breakdown by item, and balance due. The journal generates a report that shows the total owed by each customer, with an aged breakdown from any date.

The Payroll journal accommodates up to 39 employees and is keyed to the employee's name, rather than to a number. The journal automatically updates the general ledger and the year-to-date and quarter-to-date data files, and calculates federal and state tax withholdings, FICA, and SDI deductions. Both paychecks and pay stubs can be printed.

While evaluating CPA + *I was continually surprised by the wealth and variety of features packed into its macros.*

To give you a quick snapshot of your financial condition at any time, *CPA +* displays or prints out a set of financial statements that includes a simple balance sheet, an income statement, and a summary of financial ratios such as current assets versus current liabilities, an inventory turnover ratio, and a profit margin on sales ratio.

For a template, *CPA +* provides an impressive number of helpful features. For instance, most double-entry bookkeeping systems don't help in making the corresponding entry, so if you debit one account you have to figure out on your own which account to credit. While *CPA +* can't make specific suggestions, program prompts nearly always point you toward the correct account. The template

also makes it extremely easy to enter beginning balances, zero out accounts, and clear the general ledger at the start of a new year—a burdensome and exacting ordeal that every bookkeeper dreads. At print time, the template also asks what type of business you run (retail, manufacturing, or service) so that the income statement is properly formatted.

CPA+ makes good use of *1-2-3*'s graphing functions, providing forecasts of cash disbursements and receipts, and summary information from the original journal entries. All these features are thoroughly described in the user manual, on an excellent tutorial disk, and through in-context help screens.

CPA+'s omission of true data entry screens, however, is a shortcoming that should give pause. When a program does not check spreadsheet entries for accuracy, the potential for problems is great. Without data entry screens, it's also easy to wander off into the macro area and, through curiosity or carelessness, damage the macros. This damage is particularly onerous with *CPA+*, because the same spreadsheet contains all eight journals. Transferring scrambled data from all these journals to an unadulterated copy of the template would be difficult, to say the least.

CPA+ does not catch errors before you finish a data entry session. Instead, it requires on a monthly basis that you invoke the Update Chart command to check that all the accounts used in the original entry journals appear in the chart of accounts. The other required monthly check is the Trial Balance report, which ensures that the books are balanced. To check for errors more frequently, you must issue these two reports more often.

An additional pitfall—*CPA+*'s original entry records can easily be altered, unlike in manual accounting and many other accounting programs. Thus no dependable audit trail is created to trace the source of errors. For this reason alone I would recommend *CPA+* only to accountants or bookkeepers who are familiar with *1-2-3* macros and who have sole responsibility for entering transactions. I would hesitate to recommend the package to people sharing bookkeeping responsibility or to those with less experience in the ways of *1-2-3*. At $695, *CPA+* isn't inexpensive, but for an educated user, there is no faster or more flexible accounting system on the market.

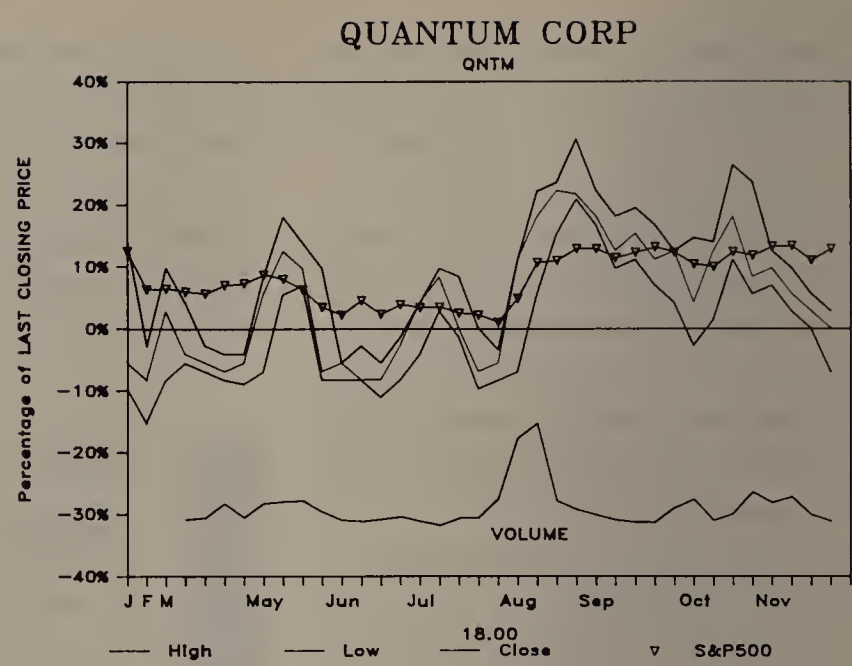
CPA+ makes it extremely easy to clear the general ledger at the start of a new year—a burdensome ordeal that every bookkeeper dreads.

Stock Record/Query/Portfolio Manager

The Stock Record module alone justifies the purchase of this program. While serving as a data base for tracking stock performance, Stock Record produces an incredible array of graphs for technical analysis. It charts high, low, close, and volume data—for one stock or a group of stocks. You can compare stocks on a one-to-one basis, in terms of relative strength against other stocks, or against an index such as the Dow Jones Industrial Average or the S&P 500. You can graph current year figures only, or graph price changes for the stock's entire history as stored in the Stock Record data base.

Stock Record also creates several graphs not provided by any other template I know of. One charts current-year data as a percentage of the year's median price, the last price, the minimum price, or another value of your choosing. The benchmark value appears as a horizontal line across the graph. Another graph charts 13-week, 26-week, and 39-week moving

Figure 2: The graph on the left charts the high/low/close quotations for Quantum Corporation as a percentage of the last closing price and includes a scaled market index (S&P 500) for comparison. The bar graph compares the low/close, high/close, and high/low ratios of four stock issues for a period specified by the user. The graph on the right charts Hewlett-Packard's 13-, 26-, and 39-week moving average, using a scaled 13-week Dow Jones Industrial Average as a reference point.



averages in one-week increments.

Keep in mind that as you accumulate stocks and data in a chart, the screen quickly grows illegible. The blame lies with the poor resolution of most PC monitors and *1-2-3*'s own graphic limitations, so it's best to stick to charting one stock or one stock and an index on screen at a time. An alternative is to rely on printouts for detail (see Figure 2).

Query lets you screen the Stock Record data base for stocks worth looking into. You're provided with thumbnail sketches of companies based on four fundamental elements: cash, assets, liabilities, and P/E ratio. Portfolio Manager handles basic portfolio maintenance, reporting on the current value of the portfolio, its potential and actual gains, and its long- or short-term capital gains status.

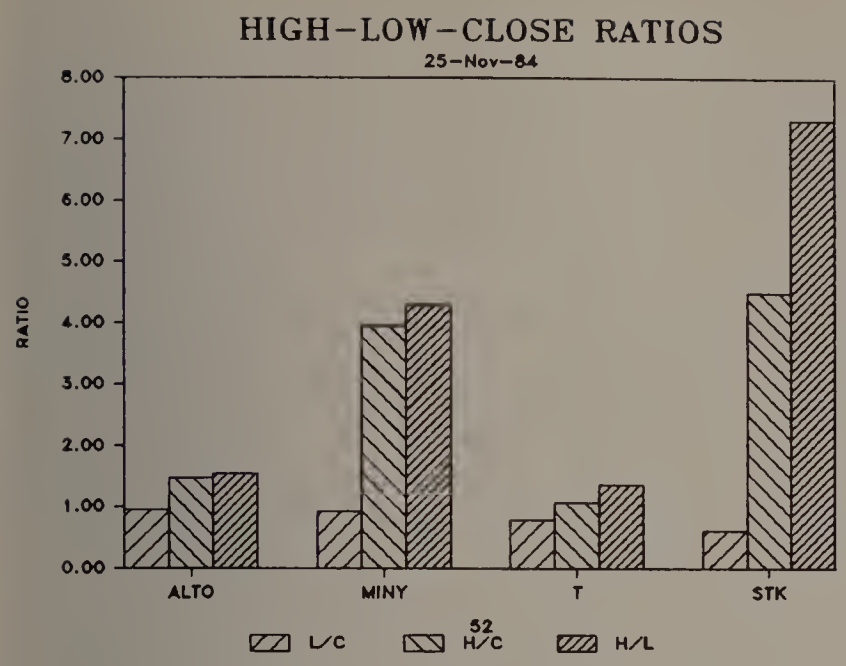
Portfolio Manager is far less compelling than the other two modules. It functions as designed, but I wouldn't recommend it. Data accuracy is unreliable because you enter data directly into the spreadsheet without validation and, to make matters worse, the portfolio matrix is cluttered with labels and entry cells.

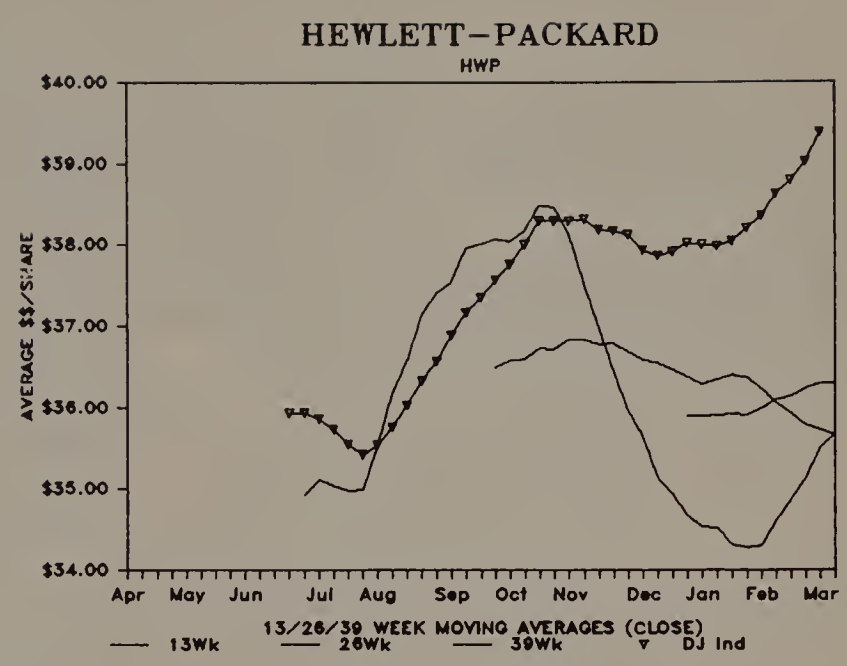
A better approach is to use a cheap portfolio management program (you can obtain free programs from on-line services such as CompuServe), convert the data into an ASCII file, and then import it into Stock Record for graphing. Perhaps the best solution is to download data from the Dow Jones News/Retrieval service using any communications software, then graph it with Stock Record. An upcoming *Symphony* version of this template will reportedly make good use of *Symphony*'s superior on-screen graphics and built-in communications program to download data from on-line services.

Final Analysis

The big question is, can template software replace dedicated programs? In many cases the answer is definitely yes. Look for open matrix templates if your application is simple and you know the basics of *1-2-3*. Semiautomated templates are fine for more complex applications—as long as you know the *1-2-3* basics and you're careful about data entry. Fully automated templates are suitable for any template application, no matter what your level of *1-2-3* expertise.

A template may not be the ideal solution for some accounting and investment applications that require a large data base. For many straightforward, modest-size applications, however, a template is clearly the most efficient and economical way to go.





Hundreds of real bargains are available–$50 and $100 templates, such as those in the *OptionWare* or *TaxCalc* series, that perform almost every conceivable accounting or tax preparation chore. Some higher-priced programs, like *CPA+*, are also good values considering the impressive number of features they offer and the boost they give to *1-2-3*.

William Urschel is a freelance writer and the author of 1-2-3 *applications software. He is currently working on stock market analysis and tax strategy projects for Hayden Books.*

Bottomline V, version 2.0
ILAR Systems, Inc.
1300 Dove St. #105
Newport Beach, CA 92660
800/828-7257, 800/523-7201 California, 714/476-2842
List price: $295
Requirements: 128K, two disk drives, 1-2-3

Key II Data Management for 1-2-3
Quadram Corp.
4355 International Blvd.
Norcross, GA 30093
404/564-1975
List price: $99
Requirements: 256K, two disk drives, 1-2-3 (version 1A)

CPA+
GNP Development Corp.
1244 E. Colorado Blvd.
Pasadena, CA 91106
818/577-7767
List price: $695
Requirements: 256K, two disk drives, 1-2-3 (version 1A)

Stock Record/Query/Portfolio Manager
MicroRealities
P.O Box 60123
Grand Junction, CO 81506
303/245-8358
List price: $125
Requirements: 256K, one disk drive, 1-2-3 (version 1A), monochrome graphics board supported by Lotus

For a free catalog of 1-2-3 and Symphony templates contact:
4-5-6 WORLD
P.O. Box 22657
Santa Barbara, CA 93121
800/524-5678, 805/564-2424

On the Trail of the Datavue 25

Quadram's innovative PC-compatible portable passes the durability test on an expedition through South America.

Eric Brown

I drove all day through the hot plains of scrub jungle before arriving in Calabozo. The town sat like a warty toad on the Venezuelan Llanos. Calabozo*—the word sent shivers down my spine. In Spanish the name means* jail. *As night fell, the streets filled with tough vaqueros and oilmen. I made my way to the outskirts of town, my Datavue 25 in hand. Inside was a fresh battery pack and a disk that contained the message.*

I arrived at the appointed cantina and entered. A few shady characters stared at me from the bar. A Julio Iglesias record was blaring from the jukebox.

"Sẽnor Brown! Ven acá," hissed a voice from a dark corner. "I've been waiting for you." I couldn't see the face, but I would know that voice anywhere. It belonged to the man, the man called . . .

"You have information." A hand penetrated the dusty light, beckoned. "I want."

I crossed the room and set the Datavue 25 down on the rum-splotched table, folded down the keyboard, and flipped on the power switch. Then I proceeded to load WordStar. *A giggle emanated from the darkness.*

"You still use WordStar?*" said the man, laughing like a jackal.*

"Well what of it?" I said defensively. "I'm used to it. I know all the commands."

"He still uses WordStar!*" he bellowed. The men at the bar broke into uncontrollable laughter. Okay hotshot, I thought, this should impress you. I yanked off the keyboard cord, walked 10 feet away, and loaded the file.*

"Big deal, infrared beam. You think that impresses me?" The man leaned forward into the light; I could see a bushy black beard and the flash of a scar.

"Well, what's wrong with it?" I stammered.

"What's wrong with it? It's a gimmick. Besides, it didn't help the PCjr any."

"Forget it, then," I said, starting to close the file. "You can buy your own computer."

A large, hairy hand grabbed the keyboard; another held a knife to my throat. "Are you threatening me?" hissed the man. "I wouldn't do that if I were you. Life is cheap in Calabozo, Sẽnor." The smell of cheap rum overwhelmed me, and I felt myself growing faint . . .

The author bearing his Datavue 25 down the Aripo River in the interior of Trinidad. Although the Datavue 25 worked perfectly in the jungle, its usefulness in data collection for biological research was limited by the short battery life.

Several months ago I tagged along with a biological expedition to the jungles of Venezuela and Trinidad and Tobago. Not to be outdone by my scientific friends and their mountain of technical gear, I brought along my own piece of high-tech wizardry, Quadram's 14-pound portable computer, the Datavue 25. Although Quadram's first entrant in the PC-compatibles marketplace was designed primarily for home and office use, I granted no handicap and showed no mercy in my testing. If the Datavue 25 could handle this South American torture test, it could handle anything.

During our travels, the Datavue 25 suffered long, bumpy ordeals in jeeps and pickup trucks. It was stymied by erratic electrical systems, scorched and dusted on the hot plains of the Venezuelan Llanos, and backpacked deep into a rain forest to record field data. It even withstood the loving embrace of a 6-foot rainbow boa constrictor. Throughout these tribulations, the Datavue 25 performed unfailingly.

But before the story unfolds, a profile is in order: The Datavue 25 measures 10½ inches high, 12¾ inches wide, and 6¼ inches deep; it fits snugly into a padded black carrying case equipped with both a handle and a shoulder strap. The computer is built around a CMOS 8088 microprocessor and comes in 128K and 640K versions, but users can expand the system by

The Datavue 25 passed the official PC World South American torture test, including this wrestling bout with a rainbow boa constrictor, with high marks.

adding standard memory chips and even an 8087 math chip. For storage, the Datavue sports one 5¼-inch floppy disk drive and a built-in RAM drive, which acts as drive B:. Power is provided by an AC adapter or a rechargeable battery pack. The detachable keyboard can be connected by cable or operated independently by infrared beam. The unit's 80-column by 25-line liquid crystal display (LCD) screen tilts to six positions and is capable of four-shade monochrome graphics. The standard model provides both an RS-232C port and a Centronics parallel port.

The Datavue 25 appears to be fully compatible with the IBM PC. It easily runs *1-2-3, WordStar, dBASE III, Symphony, Flight Simulator, Draw-It, Thor, Bluebush Chess,* and many other popular programs.

Running on RAM

The Datavue 25's best-designed feature is its elegantly simple implementation of the RAM drive. When you turn on the power, the screen displays memory as dashes along a horizontal line, each dash representing 8K of memory. You can adjust the ratio between main memory and RAM disk with the cursor keys. On my 640K system, the upper limit of the RAM disk is 360K.

Once the RAM drive is set, you load the DOS disk in the disk drive on the right side of the computer and press <Enter>. However, you must insert the disk with the label facing toward the rear, or the computer can't read it. The drive was designed "backward" to position the sensitive read/write head as far as possible from the heat-producing power supply. This idiosyncrasy may provide a primitive form of system security.

The system reports the current time and date from the Datavue's battery-driven clock. At the DOS level you decide what to store on the RAM drive. When both the program and the data are located on the RAM disk, saving and loading files is faster, and the battery lasts longer. However, the time-consuming process of copying files into RAM should also be factored into the performance equation.

To run a program from the RAM drive, you must change the default drive by pressing <Ctrl>-<LeftShift>-D. This elicits the rather Zen-like message 'A = B/B = A', which means the disk drive is now designated as drive B: and the RAM drive is drive A:. Copy the program files from drive B: to drive A:, and start the program from the RAM drive.

Like all RAM drives, this one is fast, silent, and volatile. However, unlike with other RAM drives, a <Ctrl>-<Alt>-<Del> doesn't destroy your data—it simply resets from the disk drive. To erase the RAM drive, you can switch the computer off or press the system reset button, which empties the RAM drive and brings up the introductory screen.

Power Trips

The Datavue 25's two power options—AC adapter and rechargeable battery pack—fit (one at a time) in a slot on the lower left side of the computer. Corresponding corners of the slot and the power packs are shaved so you cannot insert the packs incorrectly.

The Datavue 25 suffered long, bumpy ordeals in jeeps and pickup trucks and even withstood the loving embrace of a 6-foot rainbow boa constrictor.

The battery pack provides about 2 hours of operation, depending on the amount of disk access. You can check battery capacity at any time by pressing <Ctrl>-<LeftShift>-B. For those accustomed to portables without disk drives, the length of battery operation may seem woefully short.

When the battery begins to run low, a red light blinks on the front of the computer below the screen. To recharge the battery, remove it from the computer and clip on the charger adapter, a short cord with a clip on one end and a plug on the other. Plug the free end of the cord into the AC adapter pack, which plugs into an electric outlet. It takes about 3 hours to fully charge the battery.

Quadram provides an ingenious second charging option—assuming that you have access to electric power. Leave the battery in the computer, and attach the clip end of the charger adapter to the AC adapter. Plug the AC adapter into an electric outlet, and plug the other end of the charger adapter into a connector on the right side of the computer (see Figure 1). Power will resume, and the warning light will stop blinking.

Although this method of recharging the battery takes longer, and the battery reaches only 80 percent capacity, it is indispensable when you want to recharge while using the computer. This alternative also acts as a battery backup against uneven power flow, a problem I suffered continually during my travels. Unfortunately, I didn't discover this secret until I had lost several pages of inimitable prose.

No Puedo Ver la Pantalla!

As I showed off the Datavue 25 to my Venezuelan friends, they were dutifully impressed with the latest technology from the North (actually from Japan, but no matter). Yet, one comment was consistently heard: "No puedo ver la pantalla," or, "I can't see the screen." I tried to explain that all LCD screens were hard to read, and that as a matter of fact, this screen was slightly better than most. Still, they shook their heads in disbelief, amazed that anybody would buy a computer with a screen so difficult to read.

The creators of the Datavue 25 realized the limitations inherent in LCD and did the best job possible under the circumstances. First, the screen can tilt upward into six different positions to a maximum of about 60 degrees. The unit's intensity control provides the second leap over the LCD screen barrier. If you press <Ctrl>-<LeftShift>-S, all normal characters appear bold while bold characters dim to normal intensity.

The screen provides the standard 640- by 200-pixel resolution in monochrome and 320-by-200 resolution in its unique four-shade graphics mode. Somewhat like the Compaq's graphics mode, the various shadings imitate colors when you use graphics programs.

The screen's finest feature, however, is its full 80-column by 25-line display. Although the true size of the screen is 4 by 9 inches, and graphics may consequently appear squashed, the full display is nonetheless a welcome highlight that several other portables lack.

Quadram recently announced an optional electrofluorescent backlit screen for the Datavue 25 and an RGB connector to plug the unit into a color monitor. The new screen was not available for testing at the time of this review but should be on the market by the time you read this. According to Quadram, the screen enhancement will not measurably increase the

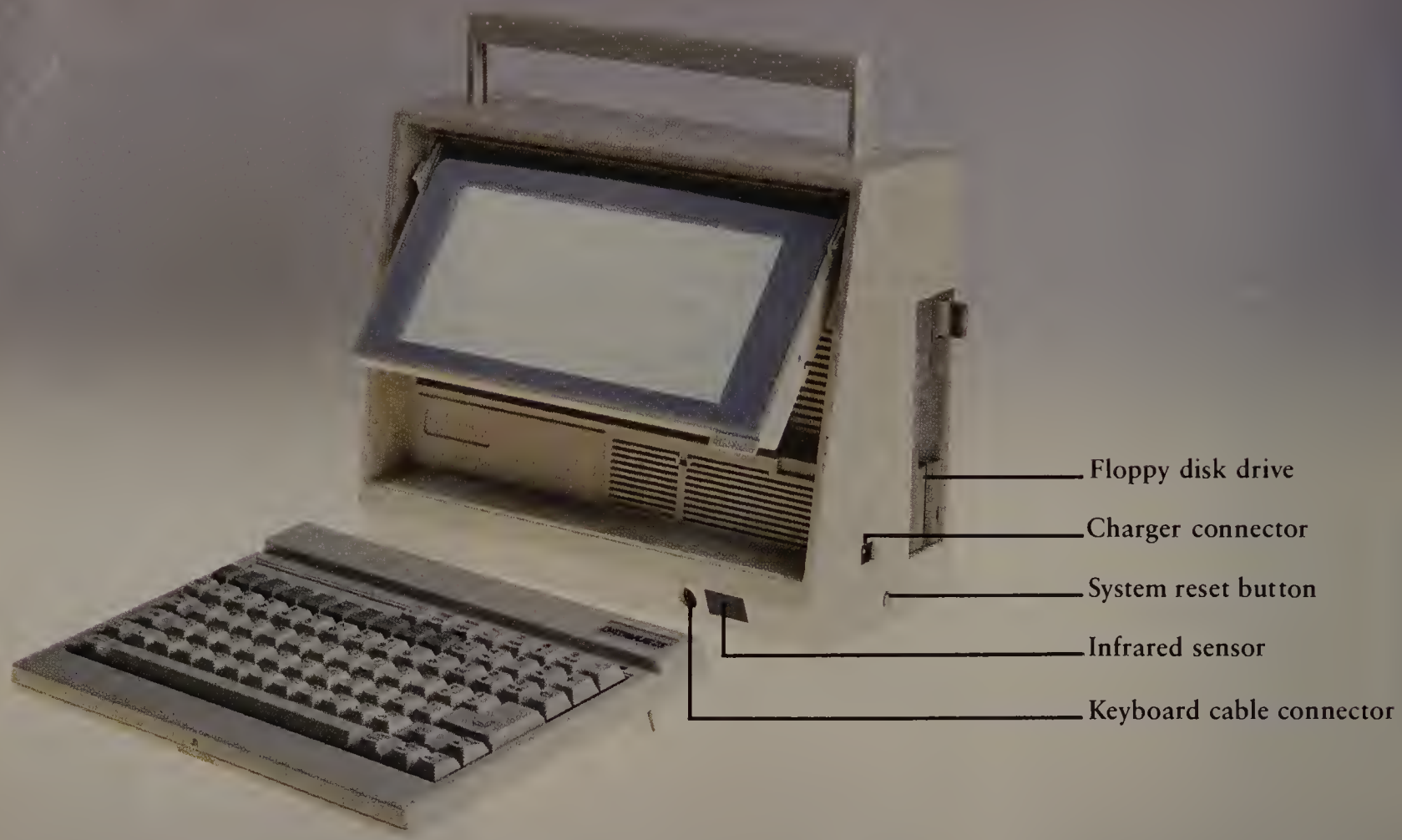


Figure 1: Side view of the Datavue 25

computer's weight or power requirements. Although backlighting should considerably improve legibility, it will also boost the system's list price by $500, increasing the cost of the 128K version, for example, from $2195 to $2695. Current Datavue 25 owners can have their old models enhanced for the same $500 price tag.

Keyboard Confusion

The Datavue's detachable infrared keyboard is independently powered by four standard AA 1½-volt batteries that fit into a slot in the upper left corner. The keyboard also comes with a standard cable. The lack of a bottom hinge on the keyboard makes using the computer difficult in tight places, such as on airline flight trays, although the unit fits quite neatly underneath the seat.

The infrared beam works from up to 12 feet away. However, pointing the keyboard more than 45 degrees away from the sensor breaks the connection. If you move out of range or if something passes through the beam while you're pressing a key, the computer may become confused. Keys can appear stuck, or untyped characters may appear on screen. On two occasions the keyboard froze altogether.

When I first tested the computer, I was appalled by the keyboard's poor response. The <Space> bar seemed particularly sluggish and failed to register about half the time when I typed at high speed. To let you know when your keystrokes have made contact, the Datavue 25 provides two feedback indicators, a red light that flickers in the upper right corner of the keyboard and an audio signal that can be modified from the keyboard. Unfortunately, the beeps and flashing LEDs are difficult to decipher and don't attack the main problem—the mushy touch of the keys.

Fortunately, Quadram recently revamped the keyboard and sent me a model to test. The layout is unchanged, but key tension is markedly improved. The <Space> bar still drops out occasionally at high speeds, but now I can type faster with fewer mistakes. Whereas the old keyboard was fit only for hunt-and-peck typists, the new version should be more than adequate for anyone who types up to 80 words a minute.

Keyboard layout is passable, although the placement of some keys may take getting used to. Function keys run across the top, and the cursor pad has been crammed into the upper right corner. Rarely used keys appear to have been squeezed in at random. Strangely enough, a blank plastic strip occupies the upper left corner. Perhaps the designers plan to add more function keys or a touch-sensitive control pad. If such options fail to materialize, I can only conclude that the keyboard was rushed into production at the last moment.

The Datavue 25 contains a number of features that set it apart from the portables crowd.

Settling Down on the Desk

A portable such as the Datavue 25 is usually bought as a second computer, perhaps as a domestic complement to an office desktop PC. You may want to expand the system to handle all the applications you use at work. Some portables don't allow you to do this, but the Datavue 25 was designed to settle down on the desk top and grow.

If you tire of constantly copying files to and from the RAM drive, you can add a second, external 360K floppy disk drive, hooking it directly to the back of the system. You can also connect a PC-compatible expansion bus that holds an independent power supply and three full-size expansion boards. A second version of the expansion chassis comes with a 10MB hard disk. For communications, you can attach your current modem to the serial port, or tuck Quadram's 1200-bps internal modem neatly into a compartment on the left side of the system. The modem comes with the *Crosstalk XVI* communications program.

To modify the computer you must flip some DIP switches, conveniently located in the motherboard compartment on the upper left side of the computer. Here you can inform the Datavue 25 of an extra disk drive, switch to a color monitor, perform ROM and RAM tests, or instruct the system to automatically set up the RAM disk in its largest configuration, thereby skipping the introductory screen.

You can find DIP switch assignments in the manual or display them on the introductory screen by pressing <Ctrl>-<LeftShift>-T. This help screen also lists system commands for battery check, contrast, intensity, audio feedback, and drive designation.

Passing the Torture Test

There is nothing like the rough-and-tumble intimacy of travel to reveal both the hidden virtues and the unpleasant idiosyncrasies of your traveling companion, whether human or computer. Although the sluggish keyboard drove me bananas, and the short battery life occasionally sent me scurrying for pen and paper, the Datavue 25 proved a durable and trustworthy fellow traveler. It passed the South American torture test with flying shades of gray.

The Datavue 25 contains a number of features that set it apart from the portables crowd. The ability to expand to a desktop system, the 80-by-25 backlit screen, the ingenious power alternatives, and the built-in RAM drive all match or supersede the talents of other entrants in this class. What's more, Quadram accomplishes all this without sacrificing competitive pricing. Whether you're collecting data in the tropical bush or taming spreadsheets in the corporate jungle, the Datavue 25 should light a path through the heart of data darkness.

Eric Brown is an Associate Editor of PC World *and the author of the South American travel book* The Alvarez Trail.

Datavue 25
Quadram Corp.
4355 International Blvd.
Norcross, GA 30093
404/923-6666
List price: 128K $2195, 640K $2795, battery pack $65, external floppy disk drive $349, expansion chassis $749, expansion chassis with 10MB hard disk $1995, 300/1200-bps internal modem (with Crosstalk XVI) $495, backlit screen and RGB connector $500, RGB connector only $350, extra-large carrying case $50, car connector $50

Every Word a Key

A new category of software, the file-indexing program, brings powerful text-searching capabilities to the PC. Now you can instantly locate any word or phrase that's in your electronic library.

Bill Crider

I have an incredible memory. Not incredible in terms of quantity or quality–incredible in the sense of incredibly capricious. And of course this applies to my work with computers: If I give a file a name that I am sure to remember, I will forget it. If I write down the name, I'll lose the note. Yet I can remember exact sentences from letters I wrote years ago.

It's not that I can't remember anything–it's just that I can't always retrieve information stored in my head, or in my computer files.

So I spend a lot of time looking through files for information. What did I call that file I downloaded from CompuServe about importing and exporting electronics? Which price quotes mention products by the Acme Company? I remember writing a letter to a guy about a program to calculate how much carpet my house needs, but I've forgotten his name, the name of the package, and even which disk has the letter. How can I find it?

My hard disk now has more than 600 files, and my floppies are proliferating faster than fruit flies. The need for help is increasingly obvious. Fortunately, a new kind of software now exists for people like me–file-indexing programs. These programs create an index of nearly all the words or specified combinations of words in the documents on your disk. The index is actually a highly compressed version of your data that includes notations of each word's location.

Only a Word Away

When you need to find a particular file or part of a file, you specify one or more words that you know are in the file. The program then searches the index and presents you with a list of files that contain the word or words specified. You can then display some or all of each file. One of the programs even lets you select a portion of the text and transfer it to a new file.

For example, I ask the program which files contain the words *import, export,* and *electronics.* Presto! The program tells me the words are found in two files and identifies them. When I search for the words *Acme Company,* the program locates only one file. When I specify *carpet,* it finds four files in my electronic library. Which one am I interested in? If the file name alone doesn't refresh my memory, I can display each of the four *carpet* files to locate the correct one.

This process is like surveying the index at the back of a book–a

valuable shortcut to specific information. The computer finds the words you request, but instead of telling you a book's page number, it tells you the name of each file containing those words.

File-indexing software for personal computers is relatively new, although similar programs have been used for over a decade to search the mainframe computer data bases of commercial information services such as Dialog (see "Gateways to On-Line Services," *PCW*, May 1985). Two leading file-index products for the PC and compatibles are *4-1-1* from Select Information Systems and *ZyINDEX* from ZyLAB. This article compares the two programs feature by feature.

Selecting Files to Index

The first step in using these programs is creating the index. I chose to index a hard disk subdirectory that contained 13 files, totaling 325K of data. I indexed the files with each program, once with *4-1-1* and twice with *ZyINDEX*, which offers two indexing methods.

ZyINDEX has a definite advantage in the indexing process. For one thing, *4-1-1* requires you to be in the same subdirectory as the files; *ZyINDEX* lets you index any directory or disk from any subdirectory or disk.

Second, although *4-1-1* has an optional directory display, the directory is not shown on the screen when you type the names of files to be indexed. Thus, you must write down or correctly remember the names of all such files. By contrast, in the *ZyINDEX* directory you move the cursor from file to file and highlight those you want indexed—you don't have to type file names at all.

Third, with *4-1-1* you can correct only the most recent entry in a list of file names to be indexed. If you discover a typing mistake in an earlier name, you must add the correct file name to the list. *ZyINDEX* allows you to "unhighlight" any file you decide you don't want indexed simply by moving the cursor to it and pressing <Enter>. And of course, since you don't have to type the names, there are no typos to correct.

Fourth, and most significant, *ZyINDEX* allows you to index files stored on floppy disks and to put your index on floppy disks if you wish. *4-1-1* is strictly a hard disk management tool. It does allow you to later transfer an indexed file to a floppy disk and will still be able to tell you which floppy the file is on—but the file must be on the hard disk when it is indexed. My text files are stored primarily on floppy disks (I consider the hard disk too vulnerable), so *4-1-1* is a less practical file-indexing tool for me than *ZyINDEX*.

The Indexing Process

After you select files for indexing, the actual indexing process begins. *ZyINDEX* has two modes of indexing: File Only (equivalent to *4-1-1*'s indexing method) and Full Text (which also stores information about each word's location within the file). The results of my three indexes (see Table 1) show that *ZyINDEX* has the edge in both speed of indexing and in the amount of disk space the resulting index uses.

One *4-1-1* asset is its ability to run other menu functions during indexing. Thus, you can locate, display, print, or transfer files already indexed while the program is creating an index of other files. Unfortunately, *4-1-1*'s indexing process is "blind"—you cannot tell what progress is being made. If you try to leave the program during indexing, a message advises you to wait until the process is completed. *ZyINDEX* does not index concurrently with other program operations, but it does keep you informed of progress by displaying the percentage of the file indexed.

In either program, once you have built your index you can add and delete files at any time.

Table 1: Speed and index file size comparison

Program	Indexing time (min:sec)	Index file size (bytes)	Percent of original files*
ZyINDEX (Full Text)	7:25	73,839	22.7
ZyINDEX (File Only)	5:55	67,894	20.9
4-1-1 (File Only)	14:15	77,643	23.8

*Original text: 325,124 bytes in 13 files

Table 2: ZyINDEX surpasses 4-1-1 on most counts.

Feature	ZyINDEX	4-1-1
Indexing on hard or floppy disk	good	poor*
Indexing speed	good	fair
Searching flexibility	excellent	good
Searching speed	excellent	excellent
File viewing	excellent	good
Printing	excellent	good
Documentation	good	good
Added features	good	good

* Hard disk required

Searching the Index

The next step in using a file-indexing program is to enter a search request. Both programs allow you to search for a single word or word combinations, such as *car* OR *auto*, or *import* AND *export*, using the Boolean operators OR and AND. *4-1-1* allows searches based on dates and titles assigned to the files.

ZyINDEX tops this by allowing searches that contain the Boolean NOT parameter, such as a search for files that contain *Acme Company* but not *July*. If you have indexed in the Full Text mode, the program allows you to narrow your search by specifying that two words must appear within a specific number of words of each other, such as *carpet* within five words of *software*.

Both programs allow use of the standard PC-DOS wild-card characters (* and ?) when searching. For example, a search for *soft** would find *software*, *softly*, and *softness*, and *c?t* would find *cat*, *cot*, and *cut*. Both programs automatically locate the plural of search words specified in the singular.

The two programs use different search request methods. With *ZyINDEX* you just type in the request as a phrase, which can be up to 160 characters long, including optional parentheses to indicate order of precedence for searching. *4-1-1* uses a more structured method whereby you type the search words in boxes. Side-by-side boxes request only files that contain both words; if the boxes are lined up vertically, *4-1-1* searches for both words and reports the names of files containing either one. Although the *4-1-1* manual explains this scheme for entering words, no screen prompts appear during the procedure. I prefer *ZyINDEX*'s direct entry.

Both programs have their indexing limitations. *4-1-1* uses the simple expedient of indexing only words with three or more characters. This eliminates a lot of chaff, but it also means you can't search for short words like *ox* or *id*.

ZyINDEX uses a "noise list" of character combinations that will not be indexed, such as *the*, *this*, *that*, and other words classified as noise, as opposed to content. If you don't like the program's noise list, you can delete or add entries.

Both programs locate documents instantaneously. Single-word searches in each program produced a list of files meeting my criteria faster than I could time the search with a stopwatch. Naturally, the longer and more complex the criteria, the slower the search –but no search took more than a few seconds.

Viewing and Printing Files

Once you retrieve a list of files containing your search words, you can either view the files or print out the list. *4-1-1* allows only sequential viewing of a file, similar to using the TYPE command.

Both programs will print the located files. *ZyINDEX* also supports the control codes of the major word processing programs, so the printed files will look as if your word processor printed them. If you don't want to print the whole file, *ZyINDEX* allows you to mark a block of text and save it as a separate file for future printing or retrieval.

Installation and Documentation

Both programs are easily installed. *4-1-1* must be in a hard disk subdirectory, while *ZyINDEX* can be either in a subdirectory or on a floppy disk. Both include sample files, indexes, and examples in the documentation.

ZyINDEX and *4-1-1* get high marks for documentation. The *4-1-1* manual is nicely typeset, with all the information you need in just 50 pages of clear explanation. *ZyINDEX*'s documentation is not as attractive, but it includes more theory and explanation of the program's numerous features.

Menus and Help Screens

Both programs provide good on-line, context-sensitive help screens. I used this feature more in *4-1-1* than in *ZyINDEX*, possibly because the *ZyINDEX* menus are almost help screens in themselves and require little or no explanation. *ZyINDEX* has one option I wish more programs had: If you don't like its help screens or menus, you can rewrite them to suit yourself.

Other Features

4-1-1 includes a major function that *ZyINDEX* lacks–data encryption. I have no current use for data security, so I looked at this feature just briefly. Because my selective memory always manages to misplace the passwords to locked files, I avoid locking them. To my way of thinking, the best way to protect a file is to keep it on a floppy disk in a vault. I never put confidential information on a hard disk. Data on a hard disk is just too susceptible to damage and prying eyes, especially in a networking system.

For someone with data security needs, *4-1-1* may be worthwhile for its encryption feature alone. It uses a public key/private key encryption method, which allows files to be locked with one key or password (the public one) but requires a different key (the private one) to unlock them.

As more files are added to an index it can become cumbersome and inefficient. *ZyINDEX* includes a utility that speeds up searches by compacting the index and removing obsolete references. The documentation says this utility can speed up searches by 50 percent. I could not confirm this, but I was working with a limited amount of data.

The Differences Are Key

Never have I seen such a clear-cut difference between two programs designed to do the same thing. *ZyINDEX* is clearly superior to *4-1-1* (see Table 2). Even if *4-1-1* were the only such product on the market, I would not buy it until the publisher added the capability of indexing floppy disk files and storing the indexes on floppy disks. *ZyINDEX*, on the other hand, is fast, effective, and easy to use. It is a worthwhile product for anyone who has a lot of information to handle.

Bill Crider is a Contributing Editor to PC World.

ZyINDEX 1.3
ZyLAB Corp.
233 E. Erie St.
Chicago, IL 60611
312/642-2201
List price: ZyINDEX Standard (indexes up to 1500 files) $145, ZyINDEX Professional (indexes up to 5000 files) $295, ZyINDEX Plus (indexes up to 15,000 files and multiuser systems) $695
Requirements: 192K, two disk drives, DOS 2.00 or later version

4-1-1, Version 1.0
Select Information Systems
919 Sir Francis Drake Blvd.
Kentfield, CA 94904
415/459-4003
List price: $149
Requirements: 256K, one hard disk and one floppy disk drive, DOS 2.00 or later version

Present WordPerfect

The latest release of this first-class word processing program adds new features and corrects old problems—resulting in a product that closely matches its name.

Terry Datz

Word processors have a way of periodically shedding their skins and emerging in shiny new packages. With each successive release of a program, the publisher tacks on more features and devises new twists for existing ones. But features don't tell the whole story. After several revisions, some programs grow so unwieldy that their operation slows to a crawl. Happily, such is not the case with the latest release of *WordPerfect*. With version 4.0, SSI Software has polished the program's rough spots and embellished it with new features without cluttering its clean screens or slowing its nimble performance.

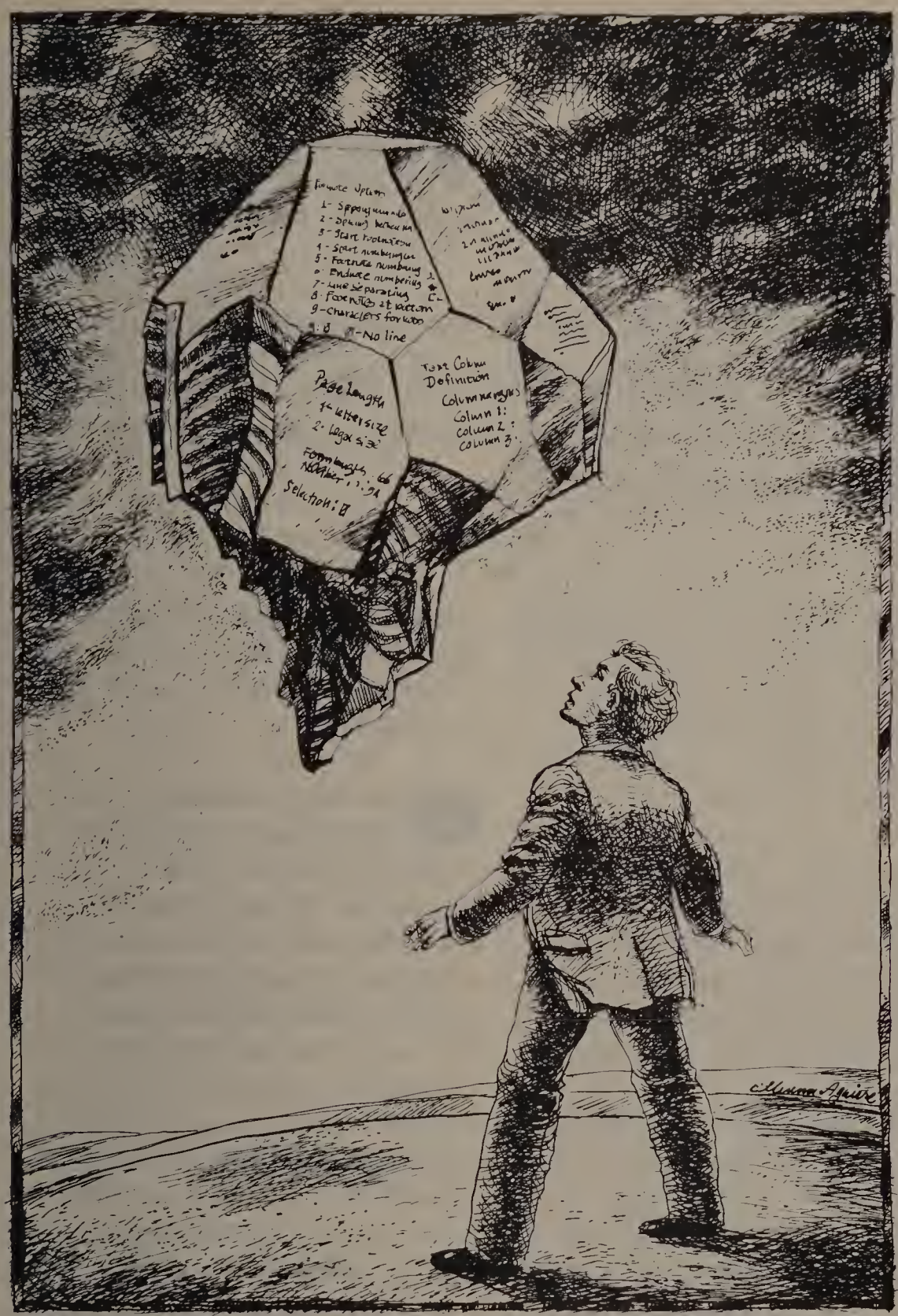
Among the capabilities that version 4.0 adds to *WordPerfect*'s already lengthy repertoire are automatic file backup, outline and paragraph numbering, and generation of indexes, lists, and tables of contents. In addition, responding to user feedback, SSI has intensified the use of the function keys, rewritten the manual, and increased the spelling checker's dictionary from 30,000 to 100,000 words.

A variety of operations are now concentrated in the function keys, making effective use of this area of the keyboard. Commands previously assigned to the top row's number keys in combination with <Ctrl> or <Alt> have been transferred to the function keys, eliminating a clumsy and inefficient command structure. Because each function key now controls four separate commands, the plastic function key template provided by SSI is a necessary prop. Although the template's print is small, color coding makes it readable: Commands printed in red combine a function key with <Ctrl>, those in blue with <Alt>, and those in green with <Shift>. Frequently used commands, such as those for saving files and getting help, are printed in black and use the function keys alone.

Smooth Start-Up

Installation is quick and easy, with the help of step-by-step instructions aimed at inexperienced users. Once you've selected your printer from among the 30 that are supported, self-explanatory prompts elicit the information needed to establish communication between program and printer.

For all its power, *WordPerfect* is compact enough to fit on three disks: a main program disk, a dictionary disk, and a supplementary disk containing learning exercises and printer files. Thankfully, none of the three disks is copy protected.



Efficient Editing

WordPerfect not only is aimed at, but was in a sense designed by, users who spend long hours at the keyboard. Through repeated testing, SSI's programmers learned that all-day users wanted a program that, above all, wouldn't get in their way. As a result, *WordPerfect* is geared for streamlined editing, with minimal intrusion from menus and prompts. This low-profile philosophy is exemplified by the editing screen, which is empty except for column, line, and page-number indicators in the bottom right corner.

Getting from place to place in a document is easy. In addition to moving the cursor by word, screen, and page, you can scroll by a specified number of lines or pages or jump directly to any character or page number. As you insert, delete, and perform other editing tasks, *WordPerfect* automatically reforms text to fit the current format settings. But unlike most word processors, the program waits until you move the cursor forward through your text to perform the reformat. To reform text without moving the cursor, you give the Rewrite command, <Ctrl>-<F3>.

An improvement that's been a long time coming to *WordPerfect* is the highlighting in inverse video of blocks of text marked for deleting or copying; previous releases provided no visible evidence of which blocks were marked. You can easily expand or decrease the size of a marked block of text with the cursor keys, and the inverse video makes your changes instantly visible.

WordPerfect's hyphenation procedure is a potential annoyance for users accustomed to uninterrupted typing. Using a "hot zone"–a designated number of columns to the left of the right margin–the program singles out words that need splitting between lines, then beeps and waits while you position the hyphen. You can reduce or eliminate these interruptions, however, by enlarging the size of the hot zone, which allows more words to escape hyphenation (they are automatically wrapped to the next line), or by turning hyphenation off altogether.

With *WordPerfect*'s flexible macro feature you can insert often-used sections of text or execute a series of commands without retyping them time and again. Macros can be chained together so that one calls another or repeats itself a set number of times

automatically. Since each macro is stored in its own file on the default drive or directory, there's virtually no limit to the number of macros you can define or to their length.

One task that *WordPerfect* 4.0 can't handle is split-screen editing. The program offers a useful, and perhaps even preferable, alternative, however. You can load two documents into memory at the same time, and then switch back and forth between them on the screen with the press of a key. Thus, while you cannot see small sections of both files simultaneously, you can see a screenful of text (up to 24 lines with a standard display adapter) instantly in either active file, and you can easily move or copy blocks of text from one active file to the other.

WordPerfect 4.0 also lacks an "undo" feature. The only time you can retrieve text that you've mistakenly deleted is when you've used the line-delete command.

Faithful Formatting

WordPerfect concentrates formatting commands on just a few function keys, which makes remembering keystrokes easy. Frequently used features, such as boldface, underlining, and centering, are each accessed with a single keystroke; other formatting functions are carried out by pressing a function key and then following menus and prompts. For example, while <F8> turns underlining on and off, <Shift>-<F8> calls the Line-Format menu, which displays options for line spacing, tabs, margins, and the like. Similarly, <Alt>-<F8> displays the Page-Format menu, and <Ctrl>-<F8> shows the Print-Format menu.

These menus supply just enough prompting to keep you on course, showing the current settings for each formatting option as well as other pertinent information, such as the standard page-length settings for legal- and letter-size paper (see Screen 1). An example of SSI's attention to detail is the Center-Page command found in the Page-Format menu. A real time-saver for letters and other single-page documents, this command formats the page displayed on screen so that its text is centered from top to bottom when the page is printed.

In keeping with its uncluttered screens, *WordPerfect* hides all formatting codes, displaying text as it will appear on the printed page. The program cannot display right-justified margins or text in multiple columns on the screen, however. To see codes that you've inserted, you use the Reveal-Codes command, which displays the text with codes interspersed; when displayed on screen, formatting codes can be deleted with the <Backspace> key.

One of the trickiest formats for a word processor is newspaper-style columns; this program handles them effortlessly. While most word processors limit you to two or three evenly spaced columns, *WordPerfect* can handle up to five columns, all of which can be sized and spaced individually (see Screen 2). Although formatting into multiple columns doesn't take place until the file is printed, the status line at the bottom of the screen tells you which column you're editing.

You can load two documents into memory at the same time, and then switch back and forth between them on the screen with the press of a key.

Printing and Filing

WordPerfect's printing features are geared for rapid throughput. An option that's handy for short documents such as memos is printing text directly from the editing screen without first saving it to disk. Using this option, you can print either the full text of a file or just the page that is currently displayed on the screen. If you save your document before printing it, *WordPerfect* assigns it a job number and can print in the background while you edit another document. Printing and editing simultaneously does not slow either operation significantly, as often happens in other programs.

One useful option missing from *WordPerfect* is a quick way to stop printing. If the printer jams or you discover you're printing the wrong

file, the only way to put on the brakes is with a three-step command sequence.

The best thing about *WordPerfect*'s automatic file backup is that it's optional. You can have the program initiate a save at any time interval you specify, or you can take care of the saving yourself. If you, or the automatic backup feature, attempt to save a file to a full disk, you'll be prompted to change disks. The program's auto-save feature is primarily insurance against a power failure or computer breakdown, however, because the files it creates are discarded when you exit the program. Consequently, you still have to remember to save your document before exiting.

To see a listing of files in a directory, you press <F5> and type the name of the directory or drive. The program's directory screen lists files alphabetically, along with the file size and the time and date of your most recent revision. The amount of free disk space is displayed at the top of the screen, and numbered options for retrieving, deleting, renaming, printing, and importing and exporting DOS text files appear at the bottom. You can initiate any of these operations by moving the cursor to the appropriate file name and then typing the option's number.

The program also includes a security feature that lets you assign passwords to your files and a convert utility that translates *WordPerfect* files to and from several formats, including *WordStar*, DIF, and a DCA (revisable-form-text) format used by many data base management programs. The

```
Page Length

     1 - Letter Size Paper: Form Length = 66 lines (11 inches)
         Single Spaced Text lines = 54 (This includes lines
         used for Headers, Footers and/or page numbers.)

     2 - Legal Size Paper: Form Length = 84 lines (14 inches)
         Single Spaced Text Lines = 72 (This includes lines
         used for Headers, Footers and/or page numbers.)

     3 - Other (Maximum page length = 108 lines.)

Current Settings

     Form Length in Lines (6 per inch):  66

     Number of Single Spaced Text Lines: 54


Selection: 0
```

Screen 1: When you choose the page-length option from the Page-Format menu, WordPerfect gives you the current settings and other helpful information.

```
Text Column Definition

     Do you wish to have evenly spaced columns? (Y/N)  _

     If yes, number of spaces between columns:

     Number of text columns (2-5): 0

     Column margins     Left        Right
        Column 1:
        Column 2:
        Column 3:
        Column 4:
        Column 5:
```

Screen 2: The column definition screen. Unlike most other word processors, WordPerfect lets you define width and spacing for each column.

CONVERT utility also allows you to specify the characters used to delimit fields and records in files to be merged.

Merging and Spelling

WordPerfect's merging capabilities include generating form letters, printing mailing lists and reports, and assembling multiple files for printing as one document. An exceptional feature is the program's ability to display the merged text so that you can preview the final document. To save time, you can eliminate the display step and send the merged document directly to the printer. If you want to sort records for selective merges, you'll need SSI's *WordPerfect Sorter,* sold separately.

One of version 4.0's most welcome improvements is the upgrading of the spelling checker's dictionary to 100,000 words, including 20,000 legal and medical terms. You can initiate a spelling check without ending an editing session, and you can spot-check a single word, a page, or a marked block of text. Although the spelling checker doesn't automatically suggest alternative spellings for each flagged word, it will do so on request, supplying a list of phonetic matches for the word in question.

Catering to Special Interest Groups

Besides handling routine word processing chores efficiently, *WordPerfect* offers enough advanced features to meet the needs of specialized users such as medical and legal professionals, scientists, and writers. For example, footnotes can be placed at the bottom of the page on which their reference appears or compiled and printed at the end of a file. In either case, you can control their format and style down to the last detail (see Screen 3). You can specify the line spacing both within and between notes and choose a numbering mode of numerals, characters, or letters, which can be underlined, superscripted, boldfaced, or styled with any other printing option. And lengthy footnotes need never pose a problem; one footnote can span up to 300 pages if necessary.

For users who crunch numbers, *WordPerfect* has a Math/Columns mode. You can define as many as 24 columns of numbers, text, or a combination of the two. Numbers can be aligned by decimal, comma, or any other character. The program automatically calculates subtotals and totals for each column.

WordPerfect also handles four-function formulas, which makes it possible to use a number from one column as part of a calculation in another. For example, you can calculate a 5 percent sales tax in column B based on revenue figures in column A by defining column B as (A * .05).

A space-fill feature simplifies the typing of complex equations. Before typing such an equation, you set line spacing to half-line increments and fill several lines with blank spaces. Using Typeover mode, you can then insert the equation into the blank lines, using the arrow keys to move in half-line increments.

New features that will appeal to those with more sophisticated word processing needs include

```
Footnote Options

     1 - Spacing within notes                1
     2 - Spacing between notes               1
     3 - Lines to keep together              3
     4 - Start footnote numbers each page    N
     5 - Footnote numbering mode             0
     6 - Endnote numbering mode              0
     7 - Line separating text and footnotes  1
     8 - Footnotes at bottom of page         N
     9 - Characters for notes                *
     A - String for footnotes in text        [SuprScrpt][Note]
     B - String for endnotes in text         [SuprScrpt][Note]
     C - String for footnotes in note            [SuprScrpt][Note]
     D - String for endnotes in note         [Note].

     For options 5 & 6:                 For option 7:
         0 - Numbers                        0 - No line
         1 - Characters                     1 - 2 inch line
         2 - Letters                        2 - Line across entire page

Selection: 0
```

Screen 3: The footnote options screen. WordPerfect lets you control footnote style and format down to the last detail.

paragraph and outline numbering and automatic generation of indexes, lists, and tables of contents. Outlines and numbered paragraphs can have seven levels of subentries. Pressing the <Tab> key automatically indents the current line to the next sublevel and generates the appropriate number or letter for that level; pressing <Enter> generates the next number or letter on the same level. The charm of this feature lies in its ability to renumber all subsequent subentries whenever you add or delete an entry.

WordPerfect's indexing and table of contents components are easy to learn and efficient in use. Once you mark selected words, phrases, headings, and subheadings throughout your text and select formatting and numbering styles, the program will generate an index with headings and subheadings, up to five lists (for figures, charts, graphs, and so on), and a table of contents with five levels of entries.

An additional nicety is the Date command, which enables you to insert the system date in the document or in a mail merge command.

Improved Documentation

One area in which practice hasn't yet made *WordPerfect* perfect is documentation. Though the manual for version 4.0 is vastly improved over those of previous versions, it is still unworthy of the program it describes. The new manual includes a tutorial that, in combination with a set of sample files, takes you through everything from setting tabs to generating indexes. Unfortunately, the lessons focus more on which key to press next than on teaching a process that you can apply to other situations.

The completely rewritten reference section, though it thoughtfully directs you to related information elsewhere in the manual, is still short on specifics. A few features, such as background printing, are totally undocumented. In many cases you can get more specific information about a function from the on-line help feature. The on-line help is not context-sensitive, but pressing the help key (<F3>) presents an index of help topics. You get help about a command by pressing the help key followed by the command.

Fortunately, however, any shortcomings in *WordPerfect*'s documentation are offset by SSI's excellent customer support; registered owners are provided with a toll-free number and receive courteous help from a knowledgeable staff.

Powerful but Agile

Despite its numerous added capabilities, *WordPerfect* continues to perform smoothly and efficiently. You don't have to switch out of editing mode or (with the exception of the spelling checker), swap disks to access different features.

Although it lacks the intuitiveness of programs that walk you through menus or use mnemonic commands, this program isn't intended for the writer of occasional memos. Rather, it is a program that performs day-to-day word processing chores efficiently yet can also meet the most sophisticated demands. One of the rare word processors with no major flaws, *WordPerfect* shines at whatever it does.

Editor's note: As this article went to press, SSI was planning more features for WordPerfect. *The additions include a macro editor and a macro library (which saves disk space), a typewriter-style printing option, and a windowing option to allow viewing of two files on a split screen. Switching between full-screen views of two files will still be possible if you want to see more text than a partial-screen window can display.*

Terry Datz is a freelance writer specializing in word processing applications. Her latest book, Processing Words with Your PC, PC XT or PC Compatible, *was published by the Hayden Book Company.*

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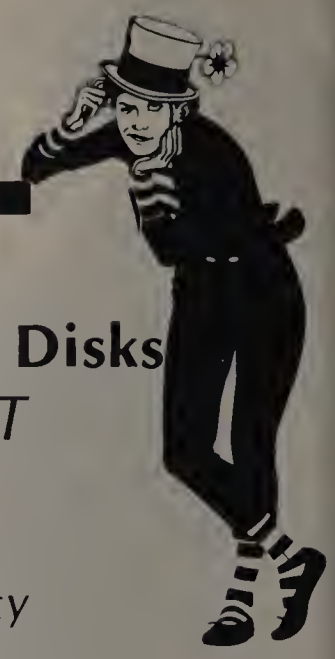

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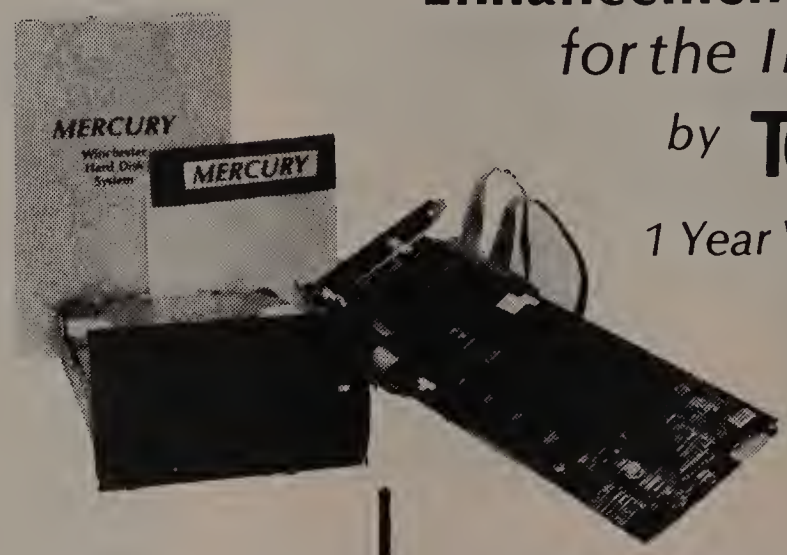

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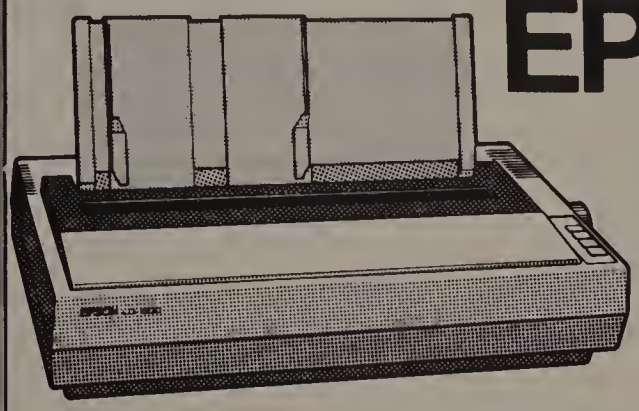

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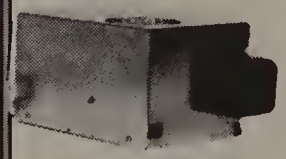

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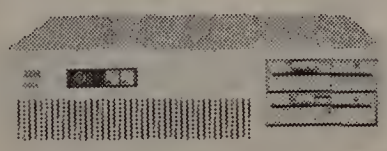

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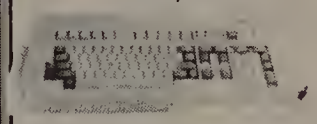

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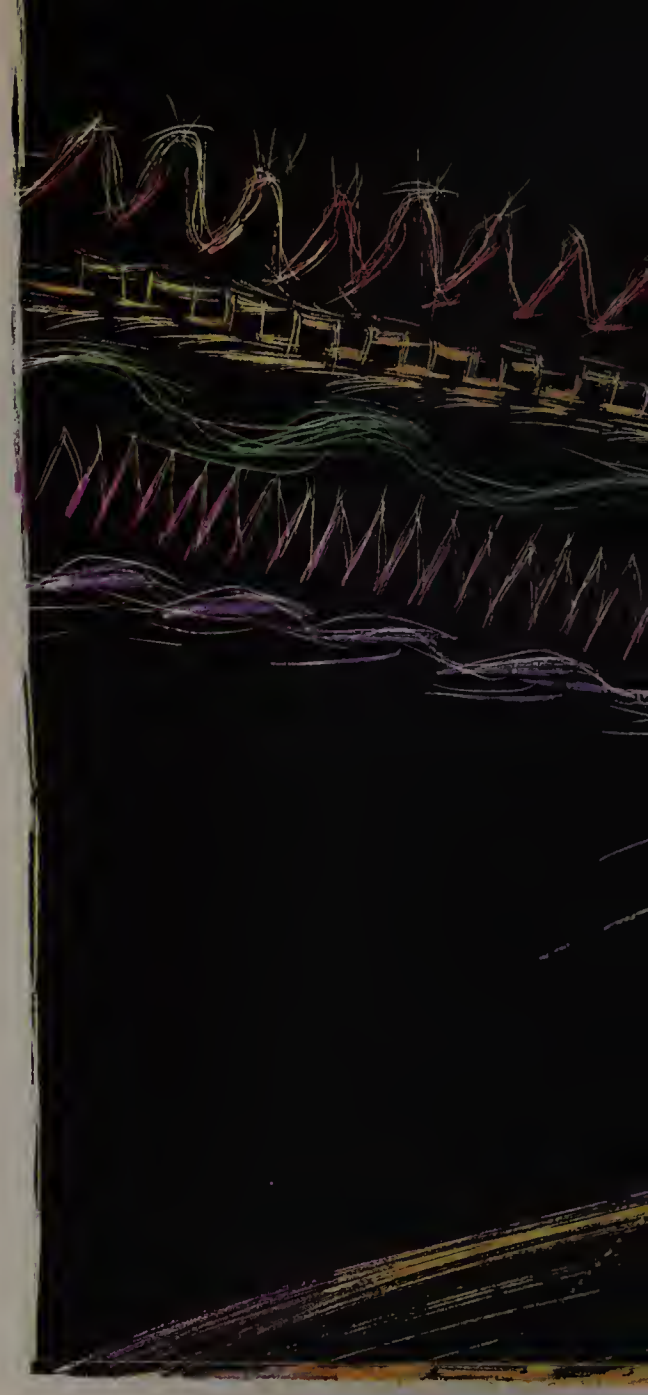
MIDI: The Music Interface

The music industry put its heads together and came up with the Musical Instrument Digital Interface. The result is an explosion in the contemporary music world—with repercussions in the world of PCs.

Warren Sirota

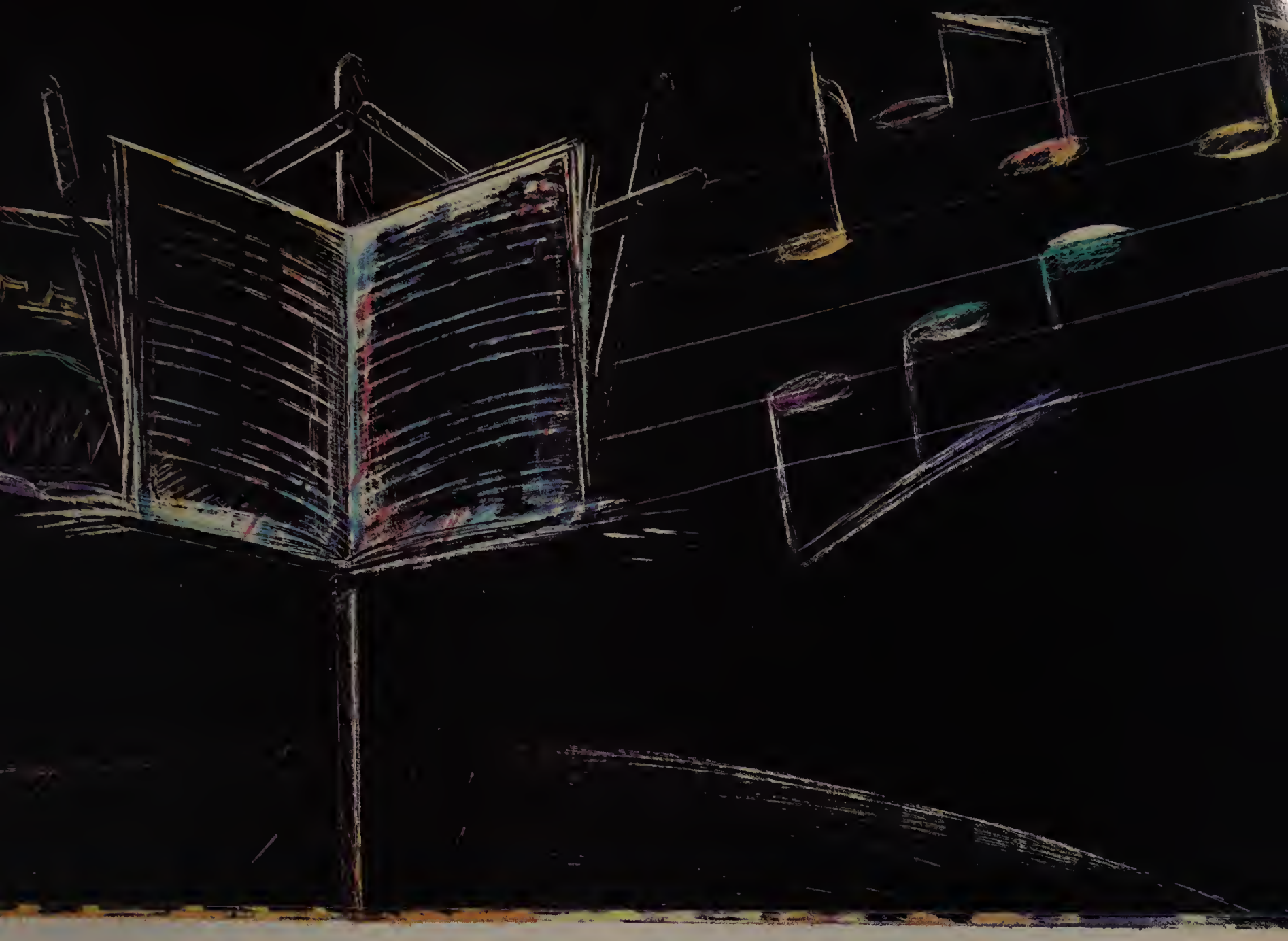
The music industry is experiencing a computer revolution as profound as the one that swept through America's businesses—and it's being spearheaded by MIDI (Musical Instrument Digital Interface). At the National Association of Music Manufacturers (NAMM) conference in January 1982, the giants of the American electronic music industry—Roland, Yamaha, E-mu, Oberheim, CBS-Rhodes, Korg, and Octave Plateau—agreed on a standard for digital communications among electronic musical instruments. The result was MIDI specification 1.0, which defines hardware and software standards that will be supported by all major manufacturers. (Copies of the specification are available from the International MIDI Association, a nonprofit group formed to promote the use of MIDI and to provide information about it.)



MIDI was developed to enable musicians to control multiple synthesizers from a single keyboard. Previously, performing musicians who wanted the sound texture possible only with several instruments needed to somehow summon two hands for each component—a challenge requiring multiple octopuses or a large stage crew. MIDI solved the problem by allowing musicians to send digital signals from a master keyboard to control the other instruments on stage.

Although MIDI wasn't developed expressly to bring PCs into music making, its creators recognized that the microprocessors in the PC and those in electronic instruments like synthesizers and drum machines could, with a little planning, cooperate beautifully. But though the PC may have had the heart of a musician, its voice left something to be desired: single-voice capability limited its power to produce music of any complexity, so software developers ignored the machine's latent talent. MIDI gives the PC a voice—and what a voice, supplied by the most sophisticated electronic instruments on the market.

By automating music performance as never before, MIDI has already begun to change the way performers, music educators, and sound technicians work. Composers can keep an orchestra at hand to



bring musical ideas to life as they conceive them. Today, virtually every synthesizer produced contains MIDI circuitry, and several manufacturers have developed MIDI interfaces and software for the IBM PC, with more likely to follow.

Nuts and Bolts

MIDI specification 1.0 was released in August 1983 and is still in effect. It details the nuts and bolts that turn the PC into a composer's tool. Specifically, it defines hardware connections and communications protocols to accomplish the transmission of musical performance information.

Since MIDI was to be a system for linking electronic components, its designers' first order of business was deciding on a physical connection. They chose 5-pin DIN connectors, which were both suitable and readily available in electronics stores. The shielded twisted-pair cable that the specs called for was equally accessible.

The simplest MIDI network consists of several MIDI instruments strung together like Christmas tree lights (see Figure 1). Components (nodes) of the network can be synthesizers, drum machines, sequencers (devices that record performance information and play it back through synthesizers), or computers. Each component must have the necessary ports, labeled MIDI Out, MIDI In, and MIDI Thru. The MIDI Out port sends original messages to other nodes. The MIDI In port accepts incoming information. MIDI Thru passes a copy of incoming messages along the network.

Hitting the Right Note

MIDI messages are divided into two types: channel messages and system messages. Channel messages control the voices and modes of MIDI instruments. Each instrument on the network is tuned to a certain channel and can be set either to respond only to messages addressed to its specific channel (Poly mode) or to respond to all incoming messages regardless of their channel address (Omni mode).

Table 1: MIDI channel voice messages

Message	Status Byte	Data Bytes
Note Off	1000nnnn	0kkkkkkk 0vvvvvvv
Note On	1001nnnn	0kkkkkkk 0vvvvvvv
Polyphonic Key Pressure (after touch)	1010nnnn	0kkkkkkk 0vvvvvvv
Control Change	1011nnnn	0ccccccc 0vvvvvvv
Program Change	1100nnnn	0ppppppp
Channel Pressure (after touch)	1101nnnn	0vvvvvvv
Pitch Wheel Change	1110nnnn	0vvvvvvv 0vvvvvvv

nnnn	specifies the voice channel number
kkkkkkk	specifies the note number, 0 through 127, where 60 is middle C
vvvvvvv	specifies the key velocity
ccccccc	specifies the control number; each manufacturer defines the numbers for the controls on its own instruments
ppppppp	specifies the program number

Adapted from MIDI specification 1.0

When a synthesizer or a drum machine receives a message through its MIDI In port, it first determines whether the message is addressed to it. If so, the instrument plays the specified note and then passes the message via its MIDI Thru port to any other instruments on that channel. If the message is addressed to another channel, the component passes the message along without responding to it. MIDI recognizes 16 channels, making possible the control of 16 distinct voices in a synthesizer orchestra from a single keyboard. Without this channel organization, composers would be limited to electronic Gregorian chants.

Most MIDI messages consist of a status byte, which tells the system which type of message to expect, followed by one or two data bytes. In status bytes the most significant bit is on; for data bytes it is off. In channel messages the status byte also defines the channel for which the message is intended. (Table 1 shows the syntax for MIDI's channel messages.)

System Exclusive messages can include any number of data bytes; System Real-Time messages contain only a status byte.

The messages that MIDI defines reflect the standard's use as a remote control tool and should be viewed as communications of events rather than as commands. The channel messages Note On and Note Off are at the center of MIDI events. When a keyboard player presses a key on a MIDI-equipped synthesizer, a Note On message is sent through the MIDI Out port. Other synthesizers on the network that are tuned to the keyboard player's channel respond to the Note On message by sounding that note. When the player releases the key, a Note Off message for that note is sent, and all synthesizers on the channel respond accordingly. The effect can be enhanced by using a sequencer to record and combine successive tracks of a performance.

Most new synthesizers can measure the velocity with which a key is pressed, a variable that controls the music's dynamics (loudness and softness). If the controlling keyboard has this capability, the information will be transmitted as a parameter of the Note On message. MIDI can also transmit *after touch* information, a measure of how hard the player is pressing a key *after* he or she has initially struck it.

Most synthesizers also allow a musician to enter *presets,* programmed control settings that the player can call up by entering a single number into the synthesizer's front panel. The MIDI Program Change message directs presets by remote control. Other channel messages include Control Change, which governs continuous controllers on remote synthesizers, and Pitch Wheel Change.

Don't Touch That Dial

The channel messages form the basis of the MIDI message structure, but they encompass only the broadest requirements for communicating musical events. To take advantage of the more subtle, specialized capabilities of each instrument, MIDI defines a class of messages called *System Exclusive.* The only parts of these messages that MIDI standardizes are the beginning and ending byte sequences. The status byte tells the network components that a System Exclusive message is about to begin. The next byte is a

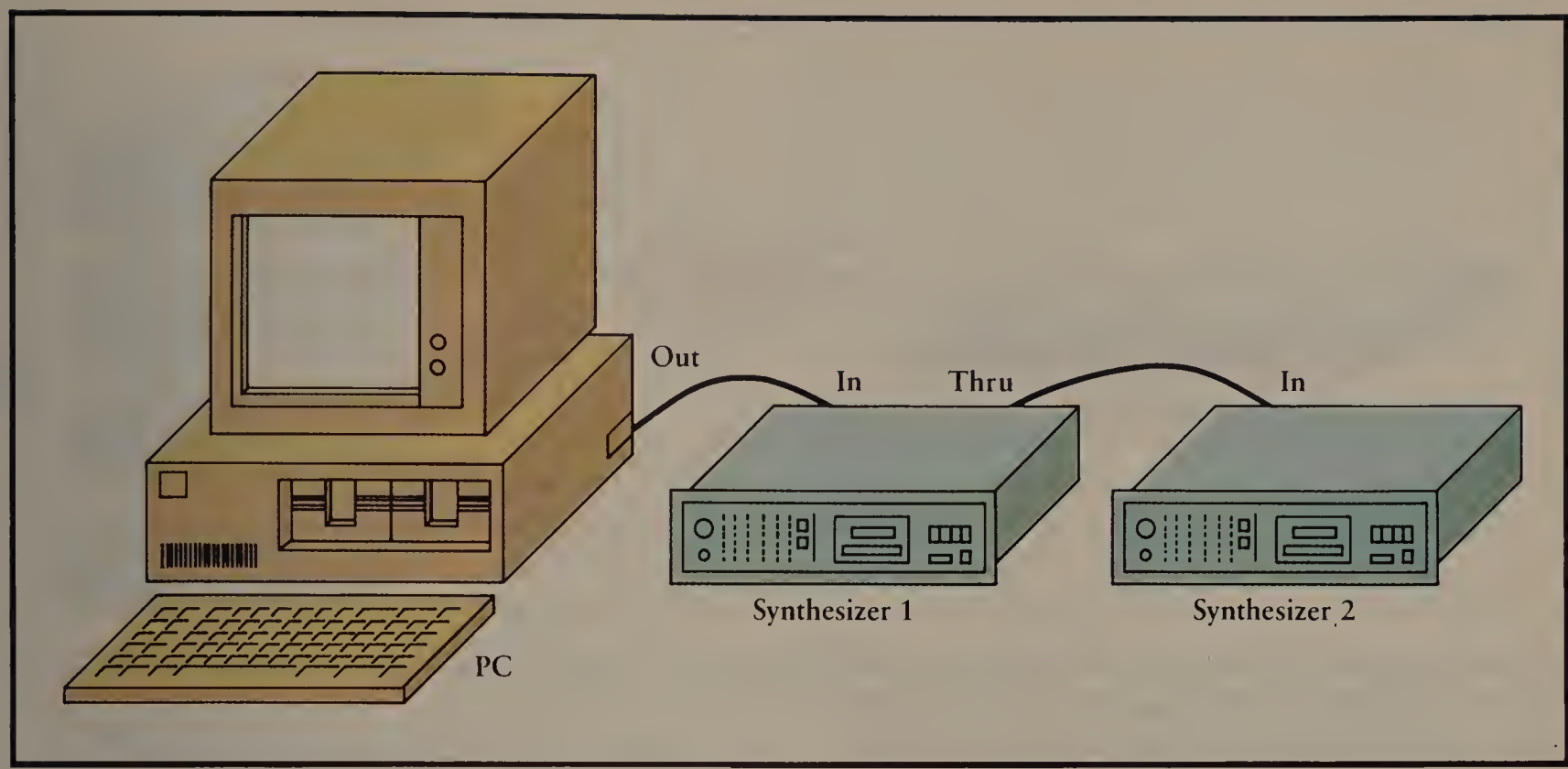


Figure 1: A simple MIDI network using the PC as a controller. The synthesizers will respond to the MIDI performance information sent out by the PC.

manufacturer code that identifies the brand of instruments for which the message is intended. The message can be any length and is terminated by a byte sequence that signifies the end of a System Exclusive message. Each instrument manufacturer defines the codes to implement functions on its own components. On many synthesizers System Exclusive messages control all the dials and switches on an instrument.

The system class of messages includes three other message types: *System Real Time*, *System Common*, and *System Reset*. These are used primarily to synchronize sequencers and drum machines.

The result of each message depends on the capabilities of each node on the network. Not every MIDI synthesizer supports all aspects of the MIDI code. A synthesizer that doesn't support keyboard velocity information will still respond to incoming Note On messages but will ignore the velocity parameter.

Other hardware limitations must also be taken into consideration. For instance, some synthesizers, like the popular Yamaha DX7, will transmit only on MIDI channel 1. If you have two such instruments on a network you must either put one of them through a *channelizer* box, which uses hardware to convert MIDI messages from one channel to another, or use a PC to intercept the messages and convert the channels via software.

MIDI recognizes 16 channels, making possible the control of 16 distinct voices in a synthesizer orchestra from a single keyboard.

The MIDI specs define a signal speed of more than 31.5 kHz–31,250 bits per second, or more than 1000 MIDI messages per second. Although a chord's individual notes are actually sent in sequence, separated by milliseconds, MIDI's speedy transmission rate enables the ear to perceive the notes as simultaneous. The same thing happens when a musician

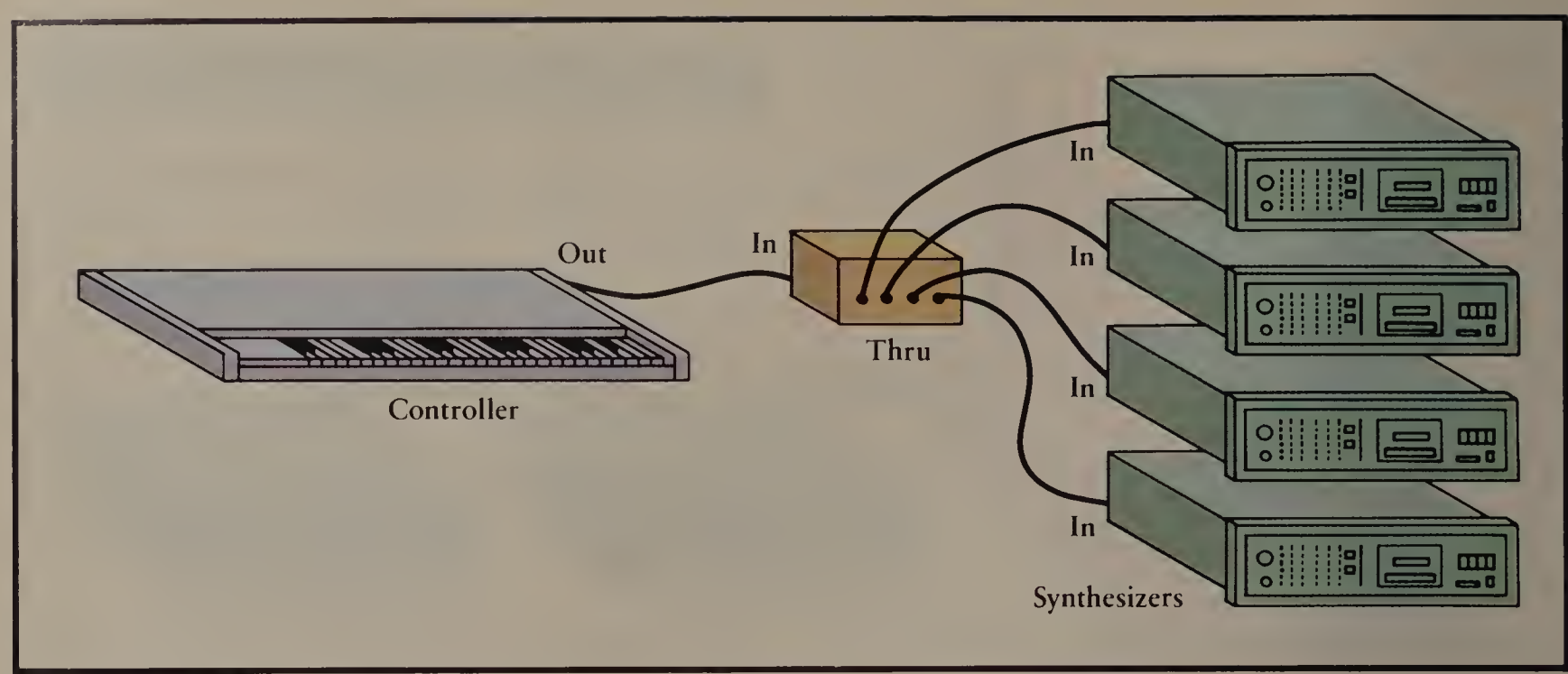


Figure 2: Sending MIDI signals through more than a few sound modules may cause a perceptible lag in the music's timing. For larger orchestras, a star configuration using a MIDI Thru box should be used. The controller can be a synthesizer, another MIDI-equipped electronic instrument, or a PC.

plays a chord on any instrument; although the notes are not played at precisely the same time, the ear hears them as a unit. The MIDI signal speed, however, is too slow to allow a message to be sent through more than four or five instruments in sequence without perceptible delays. This problem is easily solved with a star configuration using a MIDI Thru box as a distribution center (see Figure 2).

The PC Connection

To use a PC for MIDI communications, you must install a MIDI board in the computer. MIDI boards supply the necessary ports and usually include several programmable timer chips. Each timer has a baud rate generator that allows transmission at the 31.5-kHz MIDI speed. The timers also *timestamp* incoming MIDI information and measure time intervals between notes to be sent out. The resolution of the PC's internal clock, which interrupts the CPU 18.2 times per second, is not fine enough for musical purposes. Some MIDI boards also send out *tape sync* signals, timing pulses that can be recorded on an unused track of a tape to synchronize the tracks of a recording.

The PC to MIDI Card from Noteworthy Systems is one board that provides all those functions. It resembles an IBM Asynchronous Adapter in function and programming and plugs into any free PC slot. A switch on the board allows you to address the MIDI port as either COM1: or COM2:. Two connectors are provided, one for MIDI In and one for MIDI Out. In addition to a baud rate generator, the board contains two programmable counters with a resolution of up to 2 million ticks per second.

RolandCorp's MIDI adapter for the PC takes a different approach. The adapter is a small, stand-alone computer called the MPU-401—the MIDI Processing Unit. Roland hopes the MPU-401 will become the standard MIDI interface. The unit includes built-in MIDI interfaces and ROM routines that record and timestamp incoming MIDI information as well as send MIDI information out. The MPU-401 connects

to the PC via the Roland MIF-IPC interface kit, which consists of a board that plugs into a slot in the PC and a cable connecting the board to the MPU-401. Software written for use with the MPU-401 sends out MPU-401 commands rather than MIDI commands.

The Software Shuffle

At press time, most MIDI software for the PC was at the hobbyist stage. Programs with broader appeal remain in development. The software that Noteworthy Systems supplies with its board consists of demos for programmers rather than usable music software. Ryan Sanders, president of Noteworthy Systems and designer of the board, says he plans to create a programmers' source library consisting of routines in C, BASIC, and assembly language, all of which will be distributed free with the board.

Roland recently demonstrated a program, not yet released, called MPS (Music Processing System). This software illustrates the stunning possibilities of combining computers and MIDI. MPS's built-in sequencer can record all the MIDI information from a performance and, when you choose an item from a menu, generate the score of the piece just played. The program can correct small timing errors in the performance by rounding the time values of all notes to the nearest 16th note or to any other duration specified. After the music is saved, you can edit the score on screen, much as you would use a word processor to edit a document. Copy, delete, and move functions are provided, as well as less familiar functions like Transpose. The score can be printed on an Epson FX-80 or a compatible graphics printer (Figure 3). The program handles with finesse traditionally knotty notation problems, such as beaming, ties, and (with some restrictions) multiple time signatures. Eight tracks of performances can be recorded and manipulated with the MPS and then played back on a synthesizer orchestra.

MPS can record all the MIDI information from a performance and, when you choose an item from a menu, generate the score of the piece just played.

You can also experiment with the wonders of MIDI in your own programming. This can be difficult but worthwhile if your needs tend toward the offbeat. I have obtained satisfying results using Laboratory Microsystems' PC/FORTH to send MIDI messages via the Noteworthy adapter board to a Roland Juno-106 synthesizer. This setup allows me to use programming techniques like pseudo-random processing and to manipulate the Juno's controls on a note-to-note basis—capabilities not available with existing commercial software.

MIDI and Music

MIDI puts computer technology at the disposal of many composers and musicians for the first time. Before MIDI, computer-aided composition was primarily the province of those with access to large university computers and was subject to severe constraints of cost and complicated software. But the personal computer revolution is already reverberating through the music world.

MIDI is beginning to affect the way recordings are made. Studio time is a major expense for musicians, and MIDI provides a way to reduce studio time dramatically. A musician with a computer, several MIDI synthesizers, and a MIDI drum machine can create a complete, ready-to-play score in his or her own studio, taking as much time as necessary to perfect the composition. In the recording studio, the artist can then hook everything up, read the performance from disk, and have a perfect take on tape the first time.

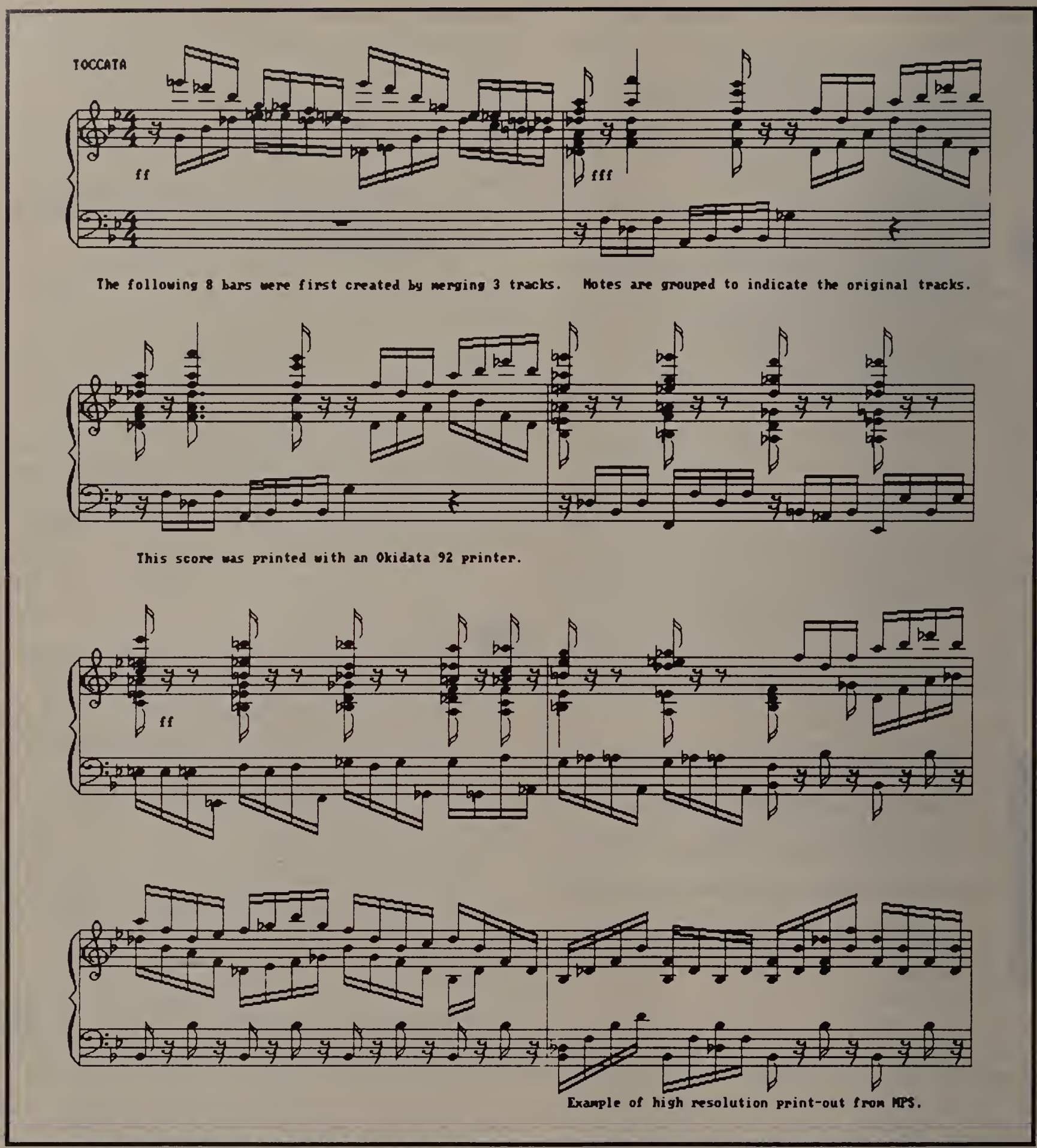


Figure 3: A score printed by Roland's MPS software. The printing facility makes printing of individual parts easy. Production of scores showing several different parts per page is possible, although not as easy, through cut-and-paste procedures.

Alternatively, a more traditional composer could use the computer simply as a sketch pad—a means of hearing how the parts of a piece fit together. When the composer is satisfied, scores can be printed out and distributed to musicians, who can then play the parts on more traditional instruments.

As the prices of electronic instruments and computers continue to drop, it becomes increasingly likely that MIDI will find its way into the home. Traditional home organ manufacturers like Baldwin already include MIDI ports in their products. The vast possibilities for educational music software and games have been explored only superficially to date.

As the prices of electronic instruments and computers continue to drop, it becomes increasingly likely that MIDI will find its way into the home.

But the computerization of music is clearly on the rise. On one hand, musicians have begun to speak of *applications* instead of *compositions;* on the other, British musicians have picketed recording studios to protest the effects of automation on employment. Computers have not affected live performances dramatically, primarily because excessive automation tends to detract from the visual and entertainment values of a performance.

Ultimately, a successful marriage of music and personal computers will depend on the quality, utility, and imagination of MIDI-based software. Progress is bound to be rapid—the field is both economically and creatively attractive to programmers right now.

Warren Sirota is a composer and programmer living in Oakland, California. He is a member of The Electric Guitar Quartet and creates computer/environmental music installations.

International MIDI Assoc.
11857 Hartsook St.
North Hollywood, CA 91607
818/505-8964

MIF-IPC MPU Interface Kit
RolandCorp US
P.O. Box 22289
Los Angeles, CA 90022
213/685-5141
List price: $110

MPU-401 MIDI Processing Unit
RolandCorp US
List price: $200

Music Processing System
RolandCorp US
List price: $495
Requirements: 192K, MPU-401

PC to MIDI Card
Noteworthy Systems
2835 Seventh St.
Boulder, CO 80302
303/444-8765
List price: $250

Lawyers On Line

Lexis and Westlaw can bring a giant legal library to your desk top. On-line costs are high, but with careful search strategies your research will pay off.

Jordan J. Breslow

The legal profession, always at the vanguard of new technology, has recently discovered that some electronic gizmo called a photo-something-or-other can make copies without carbon paper. A few of the trendsetters are dictating letters and briefs into little boxes, freeing their secretaries to perform other tasks, like erasing typos from high-tech erasable paper. But times change, and it's looking like the old-timers who refuse to talk to inanimate objects or push buttons will soon find themselves selling a type of justice that nobody will want any more.

Notable among the technological advances that are changing the way lawyers work are the on-line legal data bases Lexis, from Mead Data Central, and

PC World

Westlaw, from West Publishing Co. These services offer a staggering breadth of legal and nonlegal information, far beyond the scope of most law firm libraries. And Westlaw and Lexis can be accessed by the same personal computer that more than half of all law firms already use for word processing and timekeeping.

Everything You Want to Know

The most impressive aspect of these systems is the volume of information they offer. Both systems serve up, in full text, the decisions of the U.S. Supreme Court, of all federal circuit and district courts, and of the appellate and supreme courts in all 50 states. Both Westlaw and Lexis claim that opinions are on line within a few days after they are announced. The systems also include the entire United States Code as well as the Code of Federal Regulations and the Federal Register. A sampling of the data available is shown in Table 1. And the monthly subscription fee of $100 to $125 is comparable to the cost of library upkeep for only one or two sets of books.

This wealth of data is grouped and regrouped in various combinations, which Westlaw calls data bases and Lexis calls libraries, with each library divided into files. For example, one group might hold the decisions of all federal courts, while a smaller group would contain the decisions of the federal district courts only.

You can often learn a great deal more about a case by searching nonlegal sources.

In addition to the general sets of data, both systems cluster information for attorneys practicing in areas such as taxation, securities, intellectual property, labor, trade regulation, bankruptcy, energy, government contracts, admiralty, international trade, and military justice. These specialty data bases regroup data from other categories, bringing together, for instance, all of the cases, U.S. Code sections, and regulations that pertain to the subject. The Lexis specialty libraries and some of the Westlaw specialty data bases add supplementary material. For example, Lexis generally adds Matthew Bender publications, such as *Nimmer on Copyright*, and some Bureau of National Affairs (BNA) publications. Both systems generally add decisions of administrative bodies, such as the Federal Communications Commission (FCC), the National Labor Relations Board (NLRB), and the Securities Exchange Commission (SEC), that affect the specialty area. The data bases on Westlaw and Lexis are continually being expanded; each time you log on you may see an announcement of something new.

Westlaw supplements the text of case reports with "headnotes," which briefly summarize major points of law in each case. Westlaw also adds West's key number indexing system and a synopsis of the cases.

Nonlegal Resources

Lawyers tend to think of legal research as a hunt for cases and code sections, but you can often learn a great deal more about a case by searching nonlegal sources. A subscription to Lexis includes access to Mead Data's vast nonlegal data base, Nexis, which includes the full text of many newspapers, magazines, medical journals, financial reports, and more. You can use Nexis to search newspapers for mention of events similar to the ones on which a case is based, or review financial reports, market studies, and SEC filings to learn about defendants' or clients' net worth and the potential for collecting punitive damages. By searching trade journals you can find likely expert witnesses.

A Westlaw subscription includes Vu/Text, Knight-Ridder's news service. Although not as extensive as Nexis, Vu/Text provides on-line access to the full text of major daily newspapers like the *Boston Globe* and such minor locals as the *Gilroy Dispatch* (California). The service also includes stock quotations and the AP news service.

Table 1: Some offerings of Westlaw and Lexis

Lexis	Westlaw	
		Federal
■	■	U.S. Supreme Court decisions
■	■	Federal court of appeals and trial court decisions (all circuits, including the federal circuit and all districts)
■	■	U.S. Claims Court
■	■	United States Code
■	■	Code of Federal Regulations
■	■	Federal Register
■		Briefs filed in the Supreme Court
■	■	Presidential documents
		Federal Tax
■	■	Tax Court opinions
■		Treasury Regulations
■	■	Cumulative Bulletin (Revenue Rulings, Revenue Procedures, etc.)
■		RIA Alert files
■	■	CCH Tax Day
■		Cavitch, Business Organizations With Tax Planning
■	■	Technical Memos
		Federal Securities Law
■		SEC rules and regulations
■	■	SEC interpretive releases
■	■	SEC no-action letters
■		BNA securities regulations and law report
		Federal Labor
■	■	NLRB decisions

Lexis	Westlaw	
		Patent, Copyright, and Trademark
■		Utility, plant, and design patents
■		Manual of Classification
■	■	Court of Customs and Patent Appeals decisions
■		Chisum on Patents
■		Nimmer on Copyright
■		Gilson, Trademark Protection and Practice
■		BNA Patent, Trademark and Copyright Journal
		State Law
■	■	Supreme Court and Courts of Appeal, all states
■	■	Attorney General Opinions
■		California Deposition and Discovery Practice (Matthew Bender)
■		California Family Law (Matthew Bender)
■		California Products Liability (Matthew Bender)
		General Legal
	■	Black's Law Dictionary
■	■	Shepard's Citations
■		ABA Code of Professional Responsibility
■		ABA ethics opinions
■	■	Law reviews from major law schools
		European Law
■		English case reports
■		United Kingdom tax cases
■		United Kingdom intellectual property cases
■		French public and private cases

No More Indexes

The benefits of these services derive not only from the extent of information they offer but also from the ease with which they enable you to find information. In a traditional legal library, you are completely at the mercy of the editorial judgment and analytical legal skills of the indexers. If the information you are looking for is not indexed in the way *you* would have indexed it, you probably won't find it. For instance, to determine whether you should cash a check with a disputed note on the back saying "payment in full," you would have to look in the law book index under "Accord and Satisfaction."

Westlaw and Lexis don't depend on traditional indexes but on a free-text search for any word in any document. Instead of racking your brain for legal categories, you could just ask for material containing the words *payment in full* or *check*.

Freed from the constraints of a traditional index, you can search for opinions by a particular judge or for cases in which a particular lawyer or expert witness was involved. You can find all the cases in which a specific product was mentioned or in which a company or person was mentioned but was not a party to the suit. Both systems let you widen or narrow your search with the Boolean logical operators *AND*, *OR*, and *NOT*. (The last is expressed *AND NOT* in Lexis and % in Westlaw.)

Search Strategies

When you subscribe to Lexis, Mead outfits you with special PC software that can also be used with Nexis. Westlaw can be accessed with any asynchronous communications package, or you can obtain *LawSearch* software, designed specifically for use with Westlaw, from Direct.aid of Boulder, Colorado.

Borrowing a problem from the Lexis training class, suppose that a young man tried to defrost a refrigerator by using a hand-held electric hair dryer and was electrocuted. You want to know if his family can sue the manufacturer of the hair dryer on the grounds that customers should have been warned not to use the appliance in this dangerous manner.

The first step is to condense the research issue into one fine-tuned, concise sentence, as you would in stating the issue in an appeal. For this case you might write, "Does the failure to warn users of an injury that can be caused by a foreseeable misuse of the product subject the manufacturer to strict liability?"

Don't log on to the service yet. First you must construct your query or search request–which can actually be fun if you like puzzles or word games. Begin by choosing the keywords in the issue; for example, *warn*, *foreseeable*, *misuse*, and *strict liability*.

Because many different words can express the same idea, your search request must be expanded in several ways. First, use the root expanders * and *!*.

In a traditional legal library, you are completely at the mercy of the editorial judgment and analytical legal skills of the indexers.

You add *!* to the root of a word rather than typing in all its alternative endings. *Warn!*, for instance, retrieves cases with the words *warn*, *warned*, and *warning*. A wild card that can stand for any single character, * is useful in searching for different tenses (for example, *kn*w* finds *knew* and *know*); singular and plural forms (*wom*n* for *woman* and *women*); or words you can't remember how to spell (*rec**ve* for *receive*). Both systems automatically retrieve plurals formed by adding *s* or *es* or by changing *y* to *ies*. Next, think of synonyms and antonyms for the keywords. To the word *foreseeable*, for instance, you may want to add the synonym *predictable* (*predict!*) and the antonyms *unforeseeable* (*unforesee!*) and *unpredictable* (*unpredict!*).

The next step in query formulation is the choice of "proximity connectors," which specify relationships between keywords in a search. The connector *AND* should be used judiciously. If you want a case about informed consent, don't ask for *informed AND consent*–you may get a case with the word *informed* on page 1 and the word *consent* on page 39.

Lexis and Westlaw allow you to specify proximity by number of words. For instance, try *informed w/5 consent* (within five words) or *informed +5 consent* (within five words, with *informed* appearing first). Westlaw also allows you to specify grammatical limits. For instance, *informed /s consent* asks for files that contain the two words in the same sentence, and *informed /p consent* specifies that the words must be in the same paragraph.

If you are using Westlaw, your query might look something like this: *warn! /p (foresee! OR unforesee! OR predict! OR unpredict!) /s (use OR misuse) AND (strict OR product) /s liab!*. On Lexis the construction might be *warn! w/75 (foresee! OR unforesee! OR predict! OR unpredict!) w/50 (use OR misuse) AND (strict OR product) w/15 liab!*. (In both systems the parentheses are optional but make the query easier to read.)

Now pause for a few moments of quiet reflection. The goal is to eliminate irrelevant responses. If you are looking for cases on RICO (the Racketeer Influenced and Corrupt Practices Act), be sure to exclude cases that refer to *Puerto Rico* by using one of the negative connectors, *AND NOT* or *%*. Review your use of *!* to make sure you aren't inadvertently searching for unwanted words: *car!*, for instance, will give you *cartoon, carpet, and caribou*, among others.

With your issue defined and your search request formulated, choose the data base (Westlaw) or library and file (Lexis) you want to search. To eliminate irrelevant responses, search the narrowest group that suits your purposes.

Connect Time

After you enter your ID and the name of the account to bill your research to, specify a data base and carefully type your query. Proofread it for typos before you press <Enter>, or you'll lose precious time while the program gathers documents you'll never use. Click your heels together three times. In a few moments the computer will tell you the number of documents that satisfy your query.

If your first search request yields too many documents, review a few to see if you can eliminate an area of cases by narrowing your request with *NOT* connectors. The documents can be examined in a variety of ways. You can check each place in the document where the search words appear along with their surrounding text, or you can view the entire document. You can choose to examine only a particular portion of the document, such as the title, the opinion, or the name of the judge, or you can display and print the citations of the retrieved documents.

On Lexis, you can economize by taking advantage of the system's inverted-pyramid search technique. The first level of any search is more expensive than subsequent levels. If your search request can be separated into discrete concepts or categories, begin your search by asking for only the broadest category of documents. For the current example, your level 1 search request could be *strict OR product /15 liab!*

On Lexis, you can economize by taking advantage of the system's inverted-pyramid search technique.

AND warn! It is better to have your level 1 search yield too many cases than none or too few, in which event you would have to conduct a new level 1 search instead of a less expensive level 2 modification. Lexis retains the responses to each level, so if you reach a level with too few cases or documents, you can retreat to a previous level and review those documents without searching again.

The Good Shepard

Once you have reduced your documents to a manageable number, reviewed them, and found a case on point, you will want to know if that case has been overruled, cited as precedent by later cases, or otherwise affected by subsequent events. Every legal researcher is familiar with the loathsome but indispensable set of books known as *Shepard's Citations*. No

careful lawyer would dare cite a case in a brief without "Shepardizing" it to make sure that it is still good law.

If on June 15, 1985, you wanted to be sure that a 1965 California Court of Appeal case had not been overruled, you would have to look at the treatment of the case in five separate volumes of *Shepard's*. But by typing *sh* on Westlaw or *shep* on Lexis, you instantly have the citations from all *Shepard's* volumes. And now comes the real interactive splendor of computerized research. Each case citation has a number next to it. Type the number, and you have the case on screen.

Both Lexis and Westlaw offer an additional cite-checking service. West's Insta-Cite and Lexis's Auto-Cite show both prior history and subsequent treatment of a case, and limit the display to history

By typing sh *on Westlaw or* shep *on Lexis, you instantly have the citations from all* Shepard's *volumes.*

that directly affects the case in question, such as reversals, appeals, and new trials. Insta-Cite even told me that a Supreme Court case had been superseded by a subsequent statute, information not provided by *Shepard's*. With cases on line a few days after they're decided, both Auto-Cite and Insta-Cite are considerably more current than *Shepard's*.

When your research in the data base or file is complete, you can quickly repeat the search in another data base or file with a few keystrokes. For example, on Westlaw, by typing *s db* and the abbreviation of the new data base, you enter your query in the new data base. Although it may have taken you 10 minutes to refine your query and search the state cases for information, in another few seconds you can make the same search through federal court decisions.

If you're using Westlaw, don't read the cases on screen—the meter is running. Instead, store the text of the cases on disk, sign off, and read the saved materials at your leisure. Reading time on Lexis costs only about 46 cents a minute rather than the $2 or $3 Westlaw charges, so you can be a little more relaxed about perusing your garnered cases on screen with Lexis.

Post On-Line Depression

Unfortunately, your work isn't quite done when you sign off the service. Both systems are useful, but neither offers all the research tools you need.

The most glaring deficiency is the absence of state statutes and codes. This means that any research done on the law of another state is necessarily incomplete, and any conclusion you reach could be just plain wrong. There is hope, however; West reports it is in the process of putting codes from five major states on line.

The other notable deficiency is the systems' failure to indicate on which page of the printed text the material is located. Rules of brief-writing require that a cite for a quote extracted from a case include the page of the printed book from which it is drawn. If you quote from a case you've discovered on line, you'll have to go to the library to get the full citation.

The practice of passing the cost of computer time on to clients may be universal—both Lexis and Westlaw assume that users will do so, and provide itemized billing for that purpose. But if costs are not managed carefully, legal bills will quickly rise from their current astronomical level to something nobody will pay.

Westlaw charges $150 per hour for on-line time. Lexis's per-hour charge varies depending on what you do, and when. During peak hours on Lexis, you pay a connect charge of $28 per hour, plus between $7 and $21 (depending on the file you use) for your first search in a file, $3 for each modification to the search, and $1.25 to "Shepardize" or Auto-Cite a case. Lexis discounts some charges by 50 percent during off-peak hours. Both systems give discounts for high-volume use.

Charges can add up fast. If you're like me, you'd much rather play with electronic gadgets than sort through dusty libraries, and would turn to these data bases at every opportunity. To guard against overuse, firms must develop guidelines about when to use the systems. The overriding policy should be not to use the services unless money will be saved or better results obtained—for instance, to access volumes not available in-house or to find information not usually available through traditional indexes.

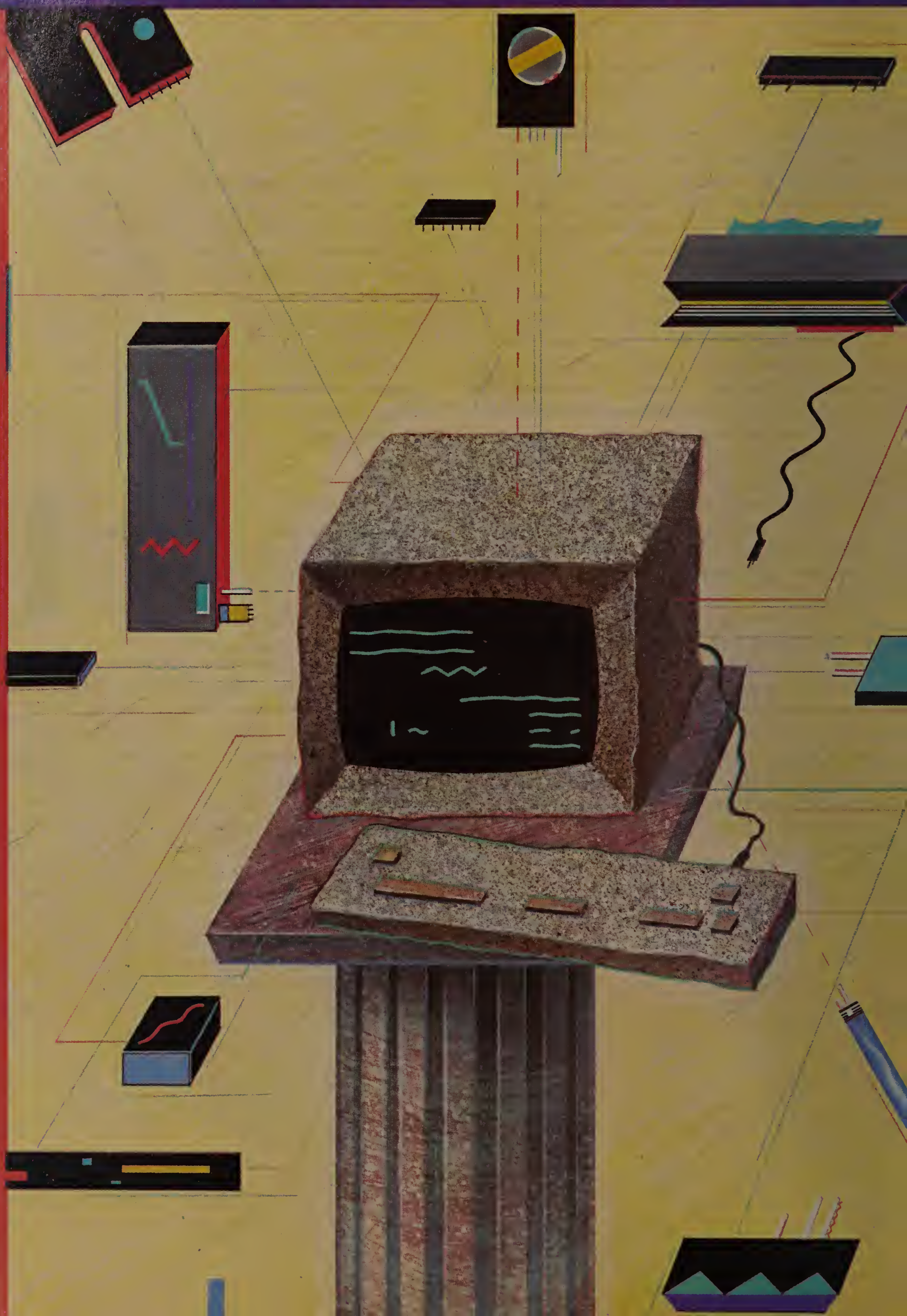
Once the decision to use the system is made, the tactics outlined here can help keep costs in line. First and foremost, remember to do your thinking and learning off line. In most instances, you should not sit down at the computer until you have a solid grasp of the subject matter and a polished search request. With a little precaution and forethought, an on-line legal search can quickly pay for itself.

Jordan J. Breslow is a partner in the Walnut Creek, California, firm of Stewart, Stewart, and Breslow, which emphasizes computer law.

Lexis
Mead Data Central
P.O. Box 933
9333 Springboro Pike
Dayton, OH 45401
800/227-9597, 513/865-6800
List price: library access fee (includes Nexis) $100/month plus $10/month per person for first 20 users, $4/month per person for next 60 users; $7-$21 per search; software $225, $165/copy for more than one copy; training $75 per person
Requirements: 128K, one disk drive, modem

Westlaw
West Publishing
50 W. Kellogg Blvd.
St. Paul, MN 55164-0526
800/328-0109, 612/228-2450 Alaska, Hawaii, and Minnesota
List price: $125/month plus $100-$150/hour, training $280 (up to four persons)

LawSearch
Direct.aid
P.O. Box 4420
Boulder, CO 80306
800/433-8080
List price: LawSearch $350, LawSearch Plus $495
Requirements: LawSearch 128K, LawSearch Plus 256K; one disk drive; Hayes-compatible modem



Retrofit Your PC

If your old PC is still humming but you long for this year's model, take heart. You can give your PC the power of an XT or an AT—or better—with a little tinkering, some choice hardware, and surprisingly few bucks.

Jeremy Joan Hewes

A few hundred thousand of us bought our computers in the PC Stone Age—when memory chips held a whopping 16K of data, the RAM capacity of the PC's motherboard was 64K, and DOS 1.10 was the state of the art. Some of us even started with single-sided disk drives. These machines still do the work we bought them for, but since that time the possibilities have exploded. Disk storage and RAM capacities have soared, and the introduction of the XT and the AT sparked envy even in owners of modern PCs.

Over the years I've added some features to my prehistoric PC, but until recently it was still pretty archaic and definitely kludgy; it sported one double-sided floppy disk drive, an internal 5MB hard disk (continually sending out 'disk full' messages) with an external power supply, and a 256K RAM board with a clock and a serial port. I had never moved up to DOS 2.00, and I had to run a special program each time I started DOS in order to use the hard disk with my old-fashioned ROM. So I decided to bring my computing power into the present.

I briefly considered selling my PC and buying an AT or a Compaq Deskpro, but a nostalgic attachment to my aging computer and an even deeper attachment to my hard-earned cash squelched the idea. Instead, I investigated all the possibilities for revamping my old PC and discovered that by buying the extra components and installing them myself, I could have the equivalent of an XT or an AT at a considerable savings over the cost of a new machine (see Table 1). To prepare for the makeover, I sorted through all the alternatives for equipment, dealers, and information—and learned a few hard lessons along the way.

System Design

Upgrading an early PC to XT level requires a 10MB hard disk and a double-sided floppy disk drive. To add the hard disk, you will also need a hard disk controller board and possibly a larger power supply and an updated ROM. To match an AT, you must add to your PC at least a 20MB hard disk, one 360K and one 1.2MB half-height floppy disk drive, new disk controller boards to handle the high-capacity floppy drive and the hard disk, and an 80286 processor.

One advantage of upgrading an old machine rather than buying a new one is the opportunity to design your own system. The system I concocted is essentially an XT, with an additional high-capacity AT floppy drive for easier hard disk backup.

Table 1: Cost of upgrading the PC[a]

Component	PC to XT+	PC to AT+
Power supply	$120	$120
ROM BIOS upgrade	$30	$30
Memory board—256K[b]	$210	
Memory board—512K[b]		$250
Floppy drives—two half height, 360K[c] each	$250	
Floppy drives—one half height, 360K; one half height, 1.2MB with controller[b]		$500
Hard disk—10MB with controller[d]	$795	
Hard disk—20MB with controller[b]		$1000
Coprocessor board—80286[e]		$1995
Total retrofit cost	**$1405**	**$3895**

[a]Lowest advertised prices, June 20, 1985
[b]Price source: DataVision, Palo Alto, CA
[c]Price source: various mail-order suppliers
[d]Price source: First Class Peripherals
[e]Price source: Seattle Telecom & Data

Memory

In recent months the PC's memory capacity has soared while the cost of memory has plummeted. The newest hardware-software schemes allow you to add up to 8MB of RAM to a PC, outstripping the AT's capacity and extending the performance of key programs. The Lotus-Intel Above Board, for example, provides a memory-management system called bank-switching, which can accommodate *1-2-3* spreadsheets as large as 4MB, in addition to a RAM disk and a print spooler of 1MB each. Many power users will want to send their computers into this memory stratosphere; the rest of us will benefit from the memory cost cuts that these megaboards will stimulate.

When upgrading my system, I bought a 512K memory board from Tall Tree Systems, which, when added to my previous configuration of 64K on the motherboard and a 256K expansion board, brought my total RAM to 832K. I used most of this memory as a RAM disk and experienced no problem—until I added a hard disk.

I discovered that the driver for the Tall Tree board used the same port address as my hard disk. Fortunately, the dealer I bought the board from allowed me to swap it for an AST model that didn't conflict with my hard disk. This taught me the most important rule of expanding a PC: Make certain that all the components—hardware and software—perform properly together.

Floppy Disk Drives

Adding floppy disk drives to a PC is generally not too complicated. You can attach two 360K floppy drives to the disk controller already installed. To make room for an internal hard disk, you can replace one full-height floppy drive with two half-height drives. You can sell the one or two full-height drives you replace, save them as backups, or even use them externally by cabling them to the disk controller.

For more storage, I installed one standard half-height floppy disk drive (360K capacity) and one AT-type half-height floppy drive (1.2MB capacity). Data written by the large-capacity drive on a 360K floppy is not always reliably read by standard 360K floppy disk drives, but the high-capacity drive can read both standard 360K and 1.2MB disks. Although I have to be careful which drive I use for each function, I have no problem copying disks or using a program disk in one drive and a data disk in the other. This configuration requires a new disk controller (replacing the PC's original floppy controller) and a driver for the 1.2MB drive. It works perfectly with my hard disk and all my software. I bought all three components—the two Teac drives and the Tall Tree Systems controller and driver—for $500 from DataVision, a consulting firm in Palo Alto, California.

Hard Disks

A hard disk—one of the handiest contraptions you can add to your system—has recently become affordable. An XT-like 10MB hard disk for your PC costs about $800 (see "Sensible Storage," *PCW*, September 1985). If you want to surpass the storage capacity of the XT, you can add a 20MB internal hard disk like the AT's for as little as $1000. Hard disks that store 30MB or more are also available, ranging in price from $1300 to $5000. Other mass storage options for the PC include 5MB or 10MB removable cartridge hard disks, which cost from $1500 to $2000, and combination devices that include a hard disk or cartridge with a tape backup system.

Obviously, price is important, but additional factors must also be given attention when you select a hard disk. Most important, be sure your disk drives operate compatibly with the PC and with all the hardware and software in your system. Consider whether the hard disk contains its own power supply or will require you to replace the one in your PC, and whether you will have to update your PC's ROM BIOS. Also evaluate the quality of the utility programs that accompany the disk—the utilities supplied for data management and backup can make these functions either a breeze or sheer agony.

Unless your hard disk has a built-in power supply, it's a good idea to replace the computer's 63.5-watt power supply with a beefier 130-watt model. Extra expansion boards will also call for more power. A dealer or repair technician will install a new power supply in your PC, or you can order one from a mail-order supplier and install it yourself. The procedure is simple: Unscrew the old unit, unplug its connecting wires, and fasten the new unit and wires in place. A new power supply will run you about $120 if you install it yourself.

Most hard disks require that the PC have a late-model ROM BIOS. The PC's original ROM BIOS did not support a hard disk. (Listing 1 is a BASIC program that displays the date of your PC's BIOS chip; if the date is earlier than 10/27/82, you have the old ROM.) Starting DOS from the hard disk requires the BIOS upgrade, but a few disk drive suppliers offer a driver that enables a PC with the original ROM to use, but not boot from, a hard disk. Quadram offers such a driver with its QuadDisks.

If your hard disk requires a new ROM BIOS, you could have quite a task ahead of you. Although installing the chip is no problem, obtaining IBM's BIOS upgrade kit (for a paltry $30) may be the toughest nut to crack in the upgrading process. For some reason, IBM has been releasing only a trickle of these chips, so they are nearly impossible to find. Most authorized dealers don't have them, and IBM Product Centers put your name on a waiting list and call you when your chip comes in. The wait averaged five months in mid-1985.

You can avoid this delay by choosing a hard disk that operates with the old BIOS, but another solution is possible. After a few hours of frustrating calls to dealers, I got lucky with Apex Information Systems in San Francisco. Owner Mike Nadelman anticipated the demand and had purchased a supply of upgrade kits when they were easier to get. He declined to sell the kit outright, however; instead, he charged the $50 the kit cost when first released, plus $45 for installation. Considering that I would otherwise still be waiting to use my hard disk, it was well worth the extra $65.

My hard disk choice was the Sider, from First Class Peripherals of Carson City, Nevada; this external 10MB drive includes a controller board and a power supply, and is linked by cable to a short expansion board in the PC. It sells for $795 and requires the BIOS upgrade. I chose an external hard disk because when the disk is separate from the computer, noise is reduced and I can move the PC around without jeopardizing the disk drive. Also, because this drive has its own power supply, I was saved the trouble of upgrading the power supply in my PC.

The most important rule of expanding a PC: Make certain that all the components—hardware and software—perform properly together.

Retrofit Components

These are the components necessary to turn your PC into an XT or AT. The products listed are the best values the author found. The prices quoted are manufacturer's list prices; careful shopping may yield even better deals. For the lowest prices found by the author, see Table 1.

Memory Boards

JRAM-2X
Tall Tree Systems
1120 San Antonio Rd.
Palo Alto, CA 94303
415/964-1980
List price: $219 with no memory; $30 for each 64K bank of memory, $45 for each 256K bank

SixPakPlus
AST
2121 Alton Ave.
Irvine, CA 92714
714/863-1333
List price: 64K $395, 256K $695, 384K $895

Floppy Disk Drives

JDISKETTE controller
Tall Tree Systems
List price: $249

Teac 55B half-height, 360K floppy disk drive
Tall Tree Systems
List price: $150

Teac 55GF half-height, 1.2MB floppy disk drive
Tall Tree Systems
List price: $200

Hard Disks

The Sider
First Class Peripherals
3579 Highway 50 E
Carson City, NV 89701
800/538-1307
List price: $795

QuadDisk
Quadram Corp.
4355 International Blvd.
Norcross, GA 30093
404/923-6666
List price: 10MB full height $1450, half-height $1195, removable $1395

ROM BIOS Upgrade Kit
IBM Product Centers
800/447-4700
List price: $30

130-watt Power Supply
IBM Product Centers
800/447-4700
List price: $350, with trade-in $225

Coprocessor Boards

Pfaster 286
Phoenix Computer Products
1416 Providence Hwy. #220
Norwood, MA 02062
617/762-5030
List price: 1MB $2395 (each additional 512K $400), 2MB $3195, 80287 add-on $350
Requirements: 128K, one disk drive, DOS 2.00 or later version

PC-286
Seattle Telecom & Data
2637 151st Pl. NE
Redmond, WA 98052
206/883-8440
List price: 6-MHz, 128K $1995 (each additional 128K $100); 8-MHz, 128K $2995 (each additional 512K $600); 10-MHz, 128K $3995 (each additional 512K $1000)

Requirements: 128K, one disk drive, DOS 2.00 or later version

PCturbo-186
Orchid Technology
47790 Westinghouse Dr.
Fremont, CA 94539
415/490-8586
List price: 128K $895, 256K $945, daughterboard only $165, 384K daughterboard $330, board with serial port for 8087 $295
Requirements: 256K, one disk drive, DOS 2.00 or 2.10

PC Turbocharger
Univation
1037 N. Fair Oaks Ave.
Sunnyvale, CA 94089
408/745-0180
List price: 512K $1195, 640K $1295, 512K with 8087 chip installed $1595, 640K with 8087 chip installed $1695

Coprocessor Boards

You'll need one last component to obtain state-of-the-art personal computing–a coprocessor board, which puts the AT's 80286 microprocessor in your PC. At press time two such boards were available: the Pfaster 286 from Phoenix Computer Products of Norwood, Massachusetts, and the PC-286 from Seattle Telecom & Data of Redmond, Washington.

The Pfaster 286 contains an 8-megahertz (MHz) microprocessor and boasts full compatibility with both the PC and the AT. The board comes with software that lets you switch between the 80286 processor and the PC's 8088 with a keyboard command. With 1MB of RAM installed, this board costs $2395.

The PC-286 can be configured with a 6-MHz, 8-MHz, or 10-MHz processor, and it has a RAM capacity of 128K to 2.5MB. The lowest-priced version of this board features a 6-MHz processor and 128K of RAM; it sells for $1995. An 8-MHz version with 128K of RAM costs $2995.

An appealing alternative to the expensive 80286 boards is the PCturbo-186 coprocessor board from Orchid Technology of Fremont, California. This coprocessor board contains an 8-MHz 80186 microprocessor (which speeds up PC performance appreciably but doesn't offer the multitasking capabilities of the 80286) and utilizes the PC's 8088 for some operations. PCturbo-186 with 128K sells for $895. Another option is Univation's PC Turbocharger, which replaces the PC's 8088 with an 8086 processor for double-time processing. (See *From the Hardware Shelf* for reviews of these two boards.)

Compatibility

At each step of the retrofitting process, diligently test the compatibility of all new components.

Incompatibility is always a concern when you are using components from various manufacturers. It can sneak up on you in many ways; the most common offenders are drivers that request the same addresses in RAM or require the same port address. Be sure to ask plenty of questions about the equipment before you buy.

It's impossible to ensure compatibility without actually testing each component with your complete system. Always insist on the right to return a component within a week or so if it does not work properly in your system. If a supplier will not offer that guarantee, either take your business elsewhere or get a demonstration of the component with a system exactly like yours. If necessary, take your own PC to the supplier's premises.

```
10 DEF SEG=&HF000
20 FOR X=&HFFF5 TO &HFFFF
30 PRINT CHR$(PEEK(X));
40 NEXT
```

Listing 1: BASIC program to display the date of your PC's ROM BIOS

Installation

If you're familiar with the inside of your PC and comfortable handling electronic gear, you can probably get the best deal by shopping around for components and installing them yourself. If you want assistance in choosing equipment or installing it, though, you have several alternatives. For the least bother, but possibly the highest cost, you can go to local PC dealers, survey the components they offer, and have one of them remake your system. Having the dealer you bought your PC from install the components may be preferable, or even essential, if you have a service contract with that dealer. The contract may be invalidated if you do the work yourself.

Many independent consultants also put together customized systems and offer installation, support, and service. Because they generally have lower overhead than retailers, consultants can often give you a price break on components. Similar price breaks and installation services are offered by many independent repair technicians as well.

Even if you locate the components on your own and intend to install them yourself, it's wise to check your selections with an experienced consultant or technician. Alternatively, ask other PC owners in a user group or on a PC bulletin board system if they have any experience with those components. By taking these precautions, you may avoid pitfalls like buying an expansion board driver that's incompatible with a hard disk.

Table 2: Comparative cost of retrofit PC and retail XT or AT

	XT	AT
IBM retail cost[a]	$3895	$5795
Minus used-PC selling price[b]	−$1250	−$1250
Cost of new IBM machine	$2645	$4545
Cost of retrofit PC[c]	$1405	$3895
Savings with retrofit machine	$1240	$ 650

[a]IBM XT includes one 360K floppy disk drive, one 10MB hard disk, 256K RAM; IBM AT includes one 1.2MB floppy disk drive, one 20MB hard disk, 512K RAM

[b]Estimated price of used PC based on survey of classified advertisements

[c]Retrofit XT includes two 360K floppy disk drives, one 10MB hard disk, 256K added RAM; retrofit AT includes one 360K floppy disk drive, one 1.2MB floppy disk drive, one 20MB hard disk drive, 512K added RAM

Comparative Costs

Tables 1 and 2 show the cost of retrofit and original XT and AT systems, based on data obtained in mid-June from a sampling of dealers, consultants, and magazine advertisements. The tables list the lowest price available for each component, excluding any installation or shipping charges.

As Table 1 shows, turning a PC into an XT is relatively cheap—$1405. Of course this does not reflect the original cost of your PC, but you'd be saving approximately $1240 over the cost of selling the old machine and buying a new XT (Table 2). Achieving AT compatibility is much more expensive at present, principally because the coprocessor boards are so new to the market that competition has not driven their prices down. Still, you'd be spending $3895 for AT power if you transformed your old PC, which is $650 less than if you sold the PC and bought a new AT.

The nameplate will still say PC, but the performance will say XT or AT. Shine up the chrome. You'll have a state-of-the-art computer for a lot less money than you thought possible.

Jeremy Joan Hewes is a Contributing Editor for PC World. *She is coauthor of* Writing in the Computer Age *(Doubleday, New York, 1983) and* Word Processing on IBM PCs *(Wiley, New York, 1985), and is currently writing* The Computer Author's Tools, *to be published by Harper & Row.*

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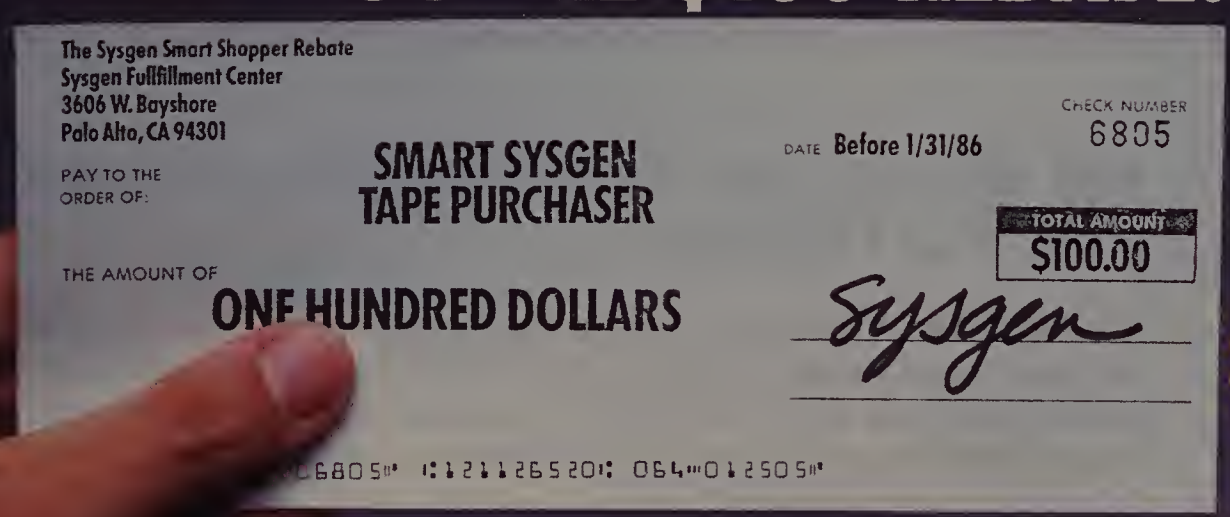

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From the Software Shelf

PC World offers first impressions of recent software releases

This month: greenbacks without gamble, the PC as slide projector, curing the SAT blues, and is your property all it should be?

Edited by Robert Luhn

Squire

Things were definitely not going well. I'd closed a deal for 250 shares of Digital Equipment Corporation stock at 86½, only to be forced to unload it at 53 a short while later. Still eager to make a killing, I tried to snap up gold at $397 an ounce but couldn't meet the margin requirements—too much of my capital was sewn up in Persian rugs, which later broke my fall when I discovered the price of gold had vaulted beyond $500.

When Uncle Sam came knocking on my door for 35 percent of my annual gruel, I could at least point to a veritable negative cash flood. That, plus the cattle herd I purchased as a tax deferment, let me close the year without paying a cent in federal income taxes.

The best education is experience without risk—or so a fortune cookie once advised me. What brings this aphorism to mind is *Squire,* a financial planning simulation package from Blue Chip Software that aspires to be something beyond a game. As the preceding scenario suggests, financial plans implemented by untutored hands can lead to disaster.

The beauty of *Squire* is that you can take a financial battering without getting beaten. *Squire,* in short, is driver training for would-be investors, drama for the serious yuppie.

In the world according to *Squire,* you don't need extraordinary moxie or fortitude, and certainly not real cash. The program nicely conveys the thrill of riding a financial roller coaster while clearly imparting the dynamics and the sheer intricacy of market forces. Even within *Squire*'s circumscribed world, the variables are staggering. In real life, it's amazing anyone makes money.

Squire's objective couldn't be simpler: Retire with enough lucre to live comfortably for the rest of your life. If you're not sure how much that is, don't fret—*Squire* assumes $1 million is sufficient.

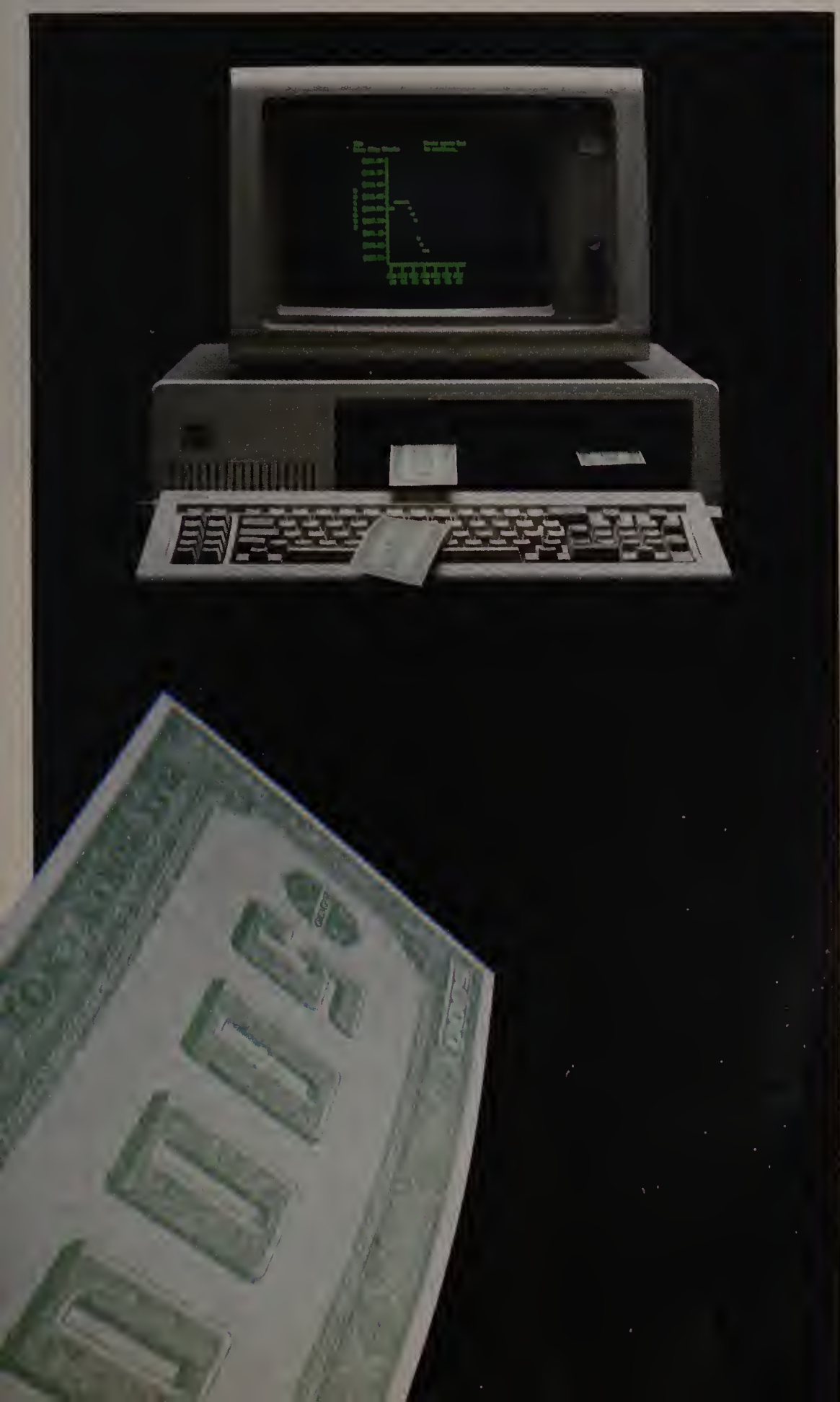
You play in either the Default (fantasy) mode, in which the financial world is created anew with each game, or the Reality mode, in which you plug in "live" data, from aging to assets; with an Income Requirements Summary you discover how far you must go before you can shuffle off to Miami. *Squire*'s Reality mode is flexible enough to allow an occasional detour, like funding a college education or buying a boat.

The program plops you down in the 14th month of a 20-year simulation. You needn't fear immediate destitution, because your initial net worth checks in at $70,500. When your net worth equals or exceeds your retirement goal, the game's over. En route to Miami, you step up the ladder in stages, from Novice to Investor, Speculator, Broker, and, ultimately, Squire. In a wry touch of reality, *Squire* warns you that remaining on the bottom rung condemns you to leeching off relatives for the rest of your life.

Your path to affluence is strewn with choices, most arising from the vicissitudes of various markets. You peruse headlines in Financial Journal—*Squire*'s terse and often cryptic news service—scrutinize economic trends and company histories, monitor the monthly price and

yield fluctuations of the program's stock issues, weigh a given asset's tax consequences, then buy and sell from an intriguing, albeit limited, cross section of investment vehicles.

For example, you can dabble in growth stocks like Federal Express and blue chip issues like IBM, stodgy bonds and high fliers, commercial and residential real estate on both coasts, IRAs, money market accounts, oil and gas partnerships, commodities, and collectibles—the sorts of investments you might hesitate to consider with real money on the line.



Squire churns out a prodigious number of reports that keep you apprised of the tax and profit/loss consequences of every transaction, year-to-date tax status, current portfolio, and overall net worth. The program also crudely charts (with asterisks) every investment's seven-month performance. It ain't VideoShow quality, but it's readable, and you don't need a graphics board.

The program's slick documentation includes a six-page guided tour of financial planning principles, addressing everything from leverage and income tax ("the investment thief") to pork bellies and annuities. *Squire* is the most general financial scenario-spinning package in Blue Chip's pecuniary quartet. *Baron*, *Millionaire*, and *Tycoon* respectively encourage you to make a killing in real estate, securities, and commodities.

Squire lives somewhere between disciplined money management and escapism—that uncharted zone where my first million probably dwells. *—Ken Greenberg*

Squire
Blue Chip Software
6744 Eton Ave.
Canoga Park, CA 91303
818/346-0730
List price: $49.95
Requirements: 128K, one disk drive
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(continues)

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For a 28" x 36" poster (suitable for framing) of "Sunrise at the Grand Tetons in Wyoming," write Mountain Computer, Inc.

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The Advertizer

Long before I was catapulted into the corporate tumult of *PC World,* I was an unassuming marketing student. I learned the ways of selling, packaging, advertising, and most important, the Zen of flip-chart maintenance. I can still remember grappling with a 5-foot easel, heavy-duty masking tape, and a Brobdingnagian flip chart in my Thursday afternoon marketing class as I made yet another presentation. Trotting out in the required corporate uniform was unnerving enough, but seeing the results of my late-night handiwork was even more so, since I often discovered my presentation was illegible or arranged in the wrong order. Needless to say, I spent a lot of time back at the drawing board.

I'm no longer a student, and my dog and pony days are thankfully over. Nonetheless, my presentation skills still come in handy, especially when I must continually remind editors to do this or sign that. It was on one such desperate occasion that *The Advertizer* fell off the software shelf and into my willing hands.

The Advertizer is a menu-driven program that turns the PC into a text-only slide projector. Whether you are giving a presentation, running a store promotion, selling your wares at a convention, or nudging procrastinating editors, *The Advertizer* can get your message up on the screen in a flash, without the bother and boredom of traditional presentation paraphernalia (see Screen 1).

The program uses a carousel metaphor for organizing related screens. Screens can accommodate up to four lines of text (8 or 16 characters per line) and can be played back in sequence like slides in a projector.

Creating a message is fairly simple. The program asks how many screens the carousel will hold, the

WHERE DID THAT NUMBER COME FROM?

	I	J	K	L	M
39	13,650	12,850	12,900	16,350	16,400
40	4,400	6,500	4,700	3,300	2,700
41	1,700	3,400	5,500	8,800	8,800
42	9,000	30,000	18,000	18,000	18,000
43	5,850	19,500	11,700	11,700	11,700
44	2,100	6,600	6,600	6,600	6,600
45	2,500	2,500	2,500	2,500	2,500
46	500	2,000	1,000		3,000
47	300	400	500	750	750
48	5,760	5,760	5,760	5,760	5,760
49	230	285	320	335	345
50	7,500	5,000	1,000	1,000	1,000
51	5,000	5,000	5,000	5,000	5,000
52		9,500			
53			2,500		2,500
54	1,500	750	750	1,000	750
55					
56	40,240	87,295	55,630	52,645	57,905

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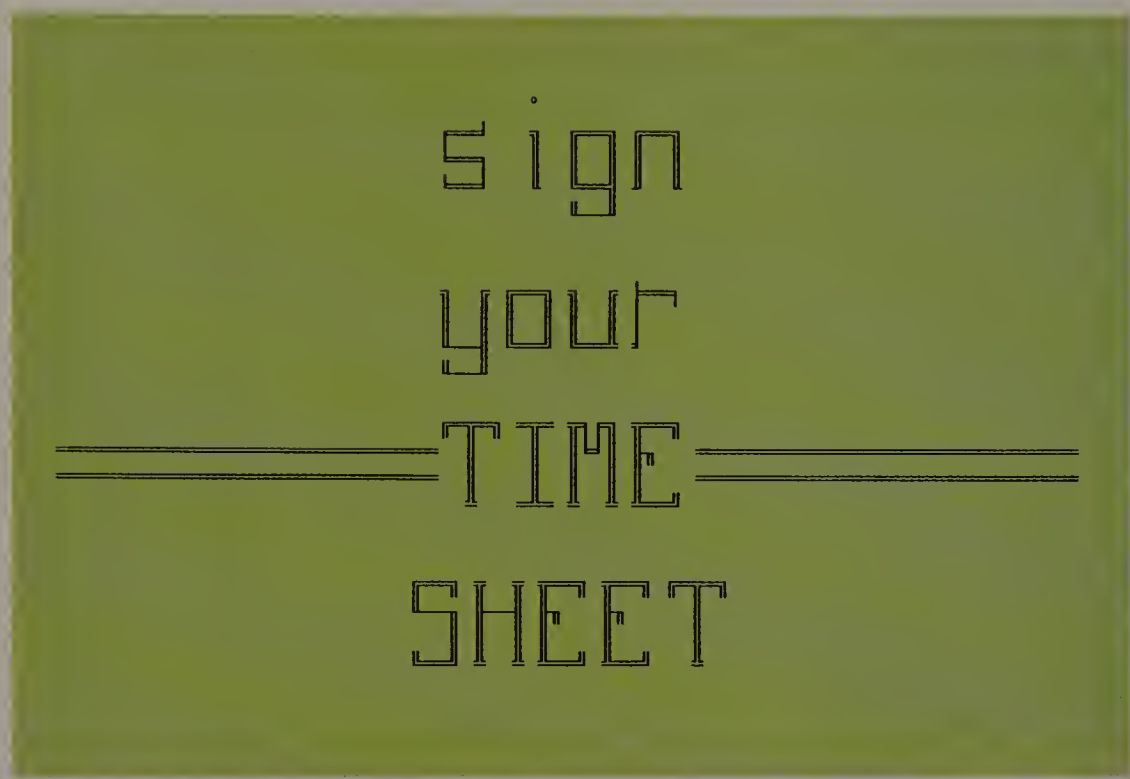
duration of the slide display, and the number of times the entire sequence will be repeated. Once a "slide" is entered, the program displays the entry in a window in the lower right corner of the screen, showing word and line spacing.

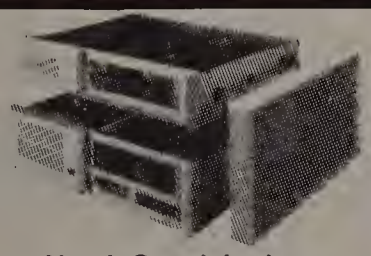
Be forewarned: A sharp eye helps when you enter and edit messages, for the program does not provide any on-screen formatting. Centering a line, for example, is no small feat. Keep in mind that the program is restricted to text display; it cannot incorporate bar charts or freehand drawings generated by paint programs. Note too that a graphics board is needed to display 8-character lines. When a color graphics board is used, messages appear in the colors of the rainbow.



Screen 1

(continues)

PCjr LIVES



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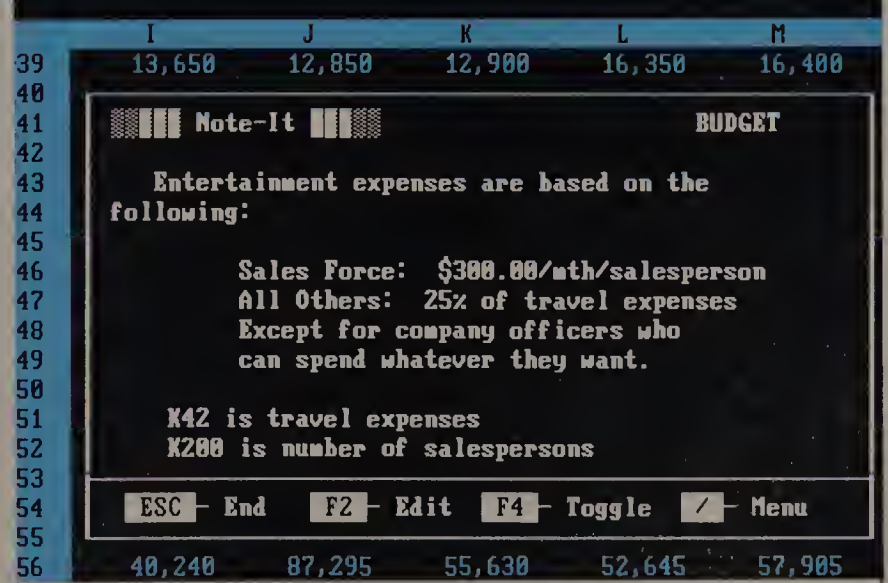
OH, YEAH.



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SAT Score Improvement System

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B. You spy the shadow of the ax murderer against your screen door.

C. You discover an envelope from the IRS.

D. There's a message to call your automobile mechanic.

The correct answer: None of the above. It's the spectre of the College Entrance Examination Board Scholastic Aptitude Test (SAT), which seven times a year reduces would-be college students to tapioca. If one or more such animals reside within your constellation, be you parent, teacher, or counselor, you might want to investigate the latest cure for College Board catalepsy–SAT preparation software. With Harvard entrants boasting SAT scores in the mid-600s and those at lesser campuses just a shade lower, ambitious high-school students would do well to avail themselves of all the help they can get. Because Amanda, my own captious resident scholar, had given her rare nod of approval to the *SAT Score Improvement System* from Hayden Software, I decided to submit my rusty scholastic aptitudes to its tutelage.

The Hayden program consists of three modules–simulated SAT exams, a verbal module, and a math module. Together they constitute a complete Mayo Clinic of SAT preparation, a carefully designed collection that provides diagnosis, prescription, remedy, and even a follow-up check.

The exam module includes one preliminary test and two practice tests, each a complete 2-hour exam with the same balance of verbal and math questions as on the SAT and scored on the SAT's infamous 800 scale. Each test is divided into four 30-minute sections, which may be taken individually or all in one bite.

The preliminary test is essentially a diagnostic tool that determines which mental muscles need further

(continues)

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- Access your data at least twice as fast.
- The Pelican system accesses stored data at 500,000 bits/second—twice as fast as regular floppy disks. And Pelican software automatically creates cache buffers in the PC memory that mirror data on disk. So it is often presented ten times faster than data coming from disk.

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- Provides data security a fixed disk can't.
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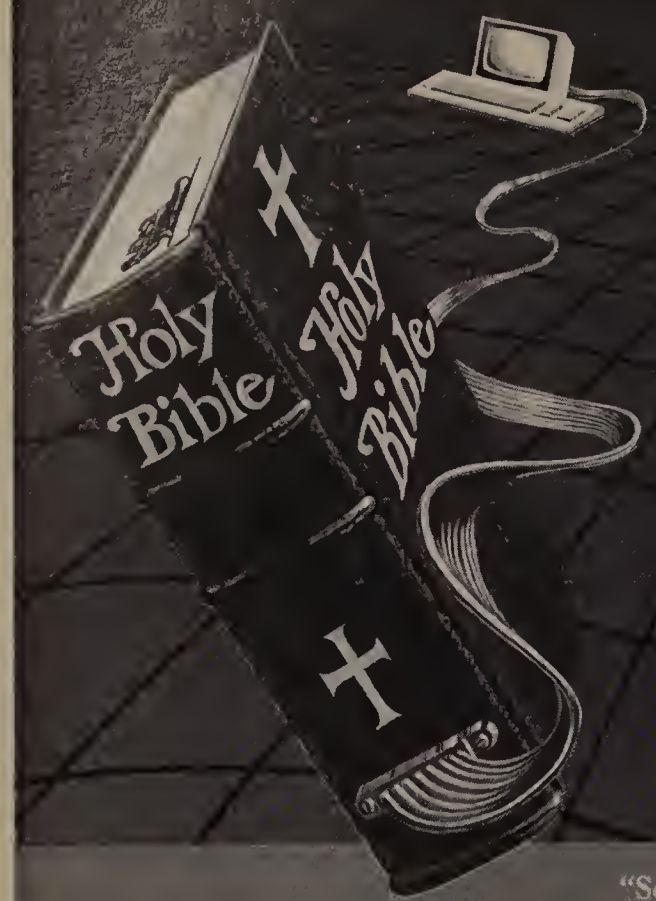

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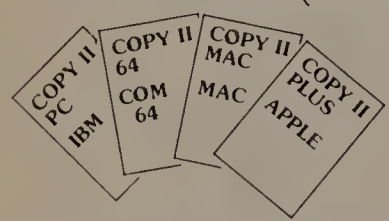

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flexing. The module analyzes responses in 16 subject areas, compiles a performance profile, and prescribes further study where needed. The practice tests to be taken after this review provide further exposure to the test format and let the student measure score improvement.

The verbal module contains sections on reading comprehension and vocabulary, including review of antonyms, analogies, and sentence completions, plus a 1000-word dictionary of posers that have recurred on SAT exams.

The math module tackles algebra, geometry, quantitative comparisons, and word problems. Instruction and practice span topics ranging from linear equations to Train A traveling toward Train B. The module, in short, explores the full phalanx of mathematical knowledge that has sent mathophobes into swoons since the first amoeba learned to multiply.

Each module can be used with or without Hayden's Tutormode instructional feature. If you answer a practice question without Tutormode, the program simply tells you which answer is correct. With Tutormode, the system provides a step-by-step explanation of how to arrive at the correct answer and, frequently, why the wrong answers are wrong. I became quite fond of the sensibility informing Tutormode–thorough but not pedantic, respectful of the user's intelligence, and occasionally eloquent. Even with Tutormode, the program provides only practice and test-taking

(continues)

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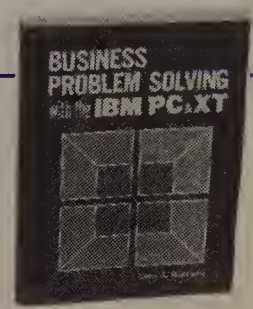

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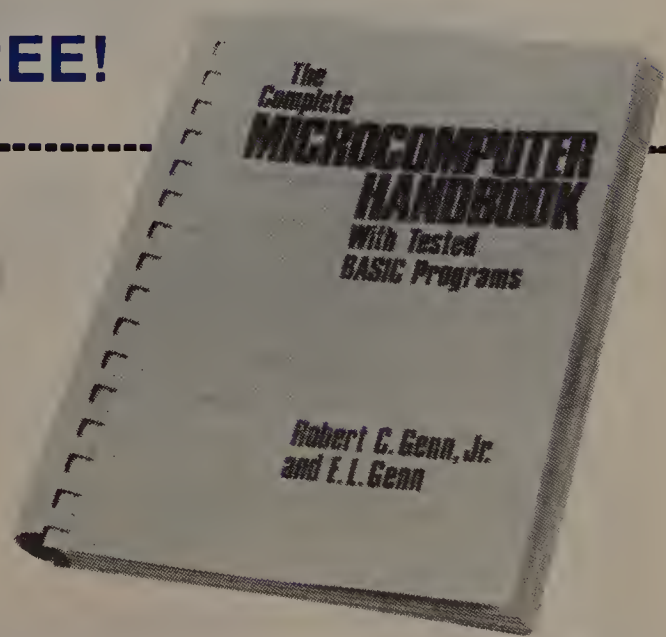

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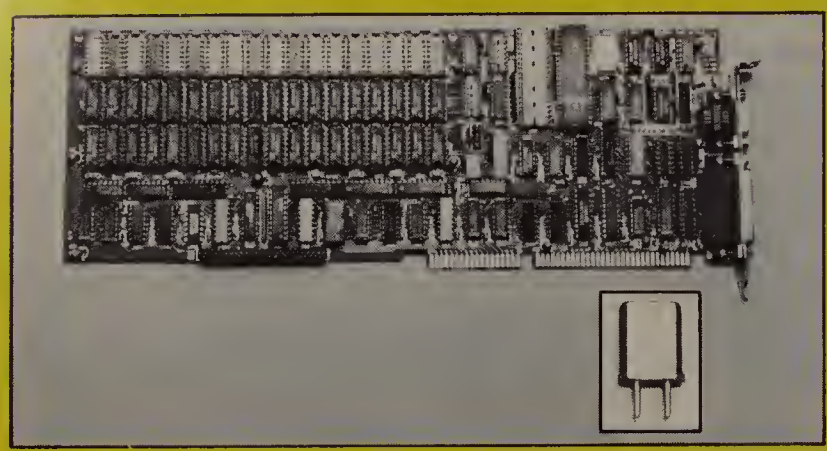

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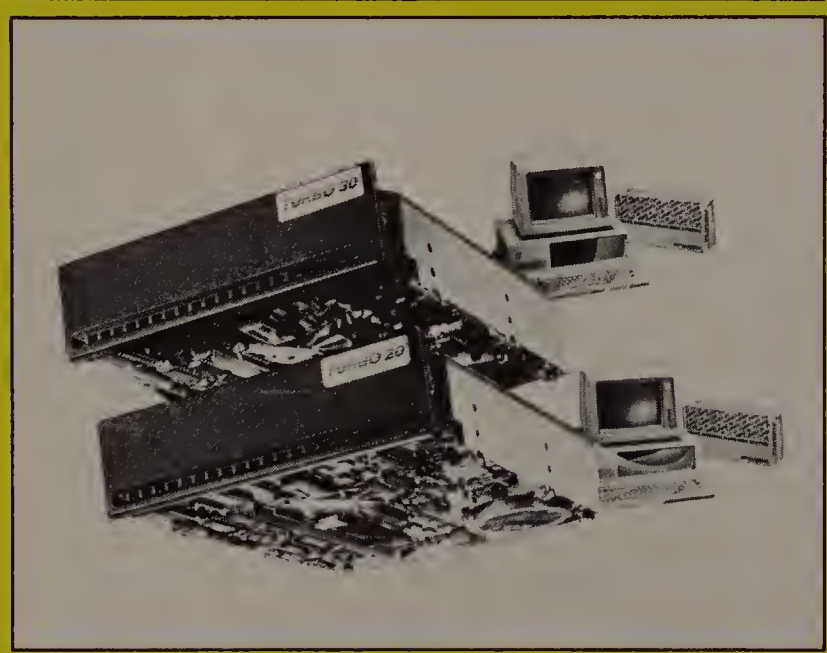

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strategy for subjects already studied—it does not provide basic instruction. The program as a whole, however, is by no means simplistic; questions are carefully chosen to give users an undiluted foretaste of the SAT's wily nature.

The system is bug-free, and you should be able to navigate through program modules without referring to the documentation, for on-screen help is comprehensive, intelligible, almost clairvoyant in anticipating your questions. Of course, the program is not without flaw. The reading comprehension passages are difficult to read on screen, and reading the questions first, then paging back to the referenced passage, as the program advises, is time-consuming. The package also does not provide preparation for the Test of Standard Written English (TSWE) that accompanies the SAT.

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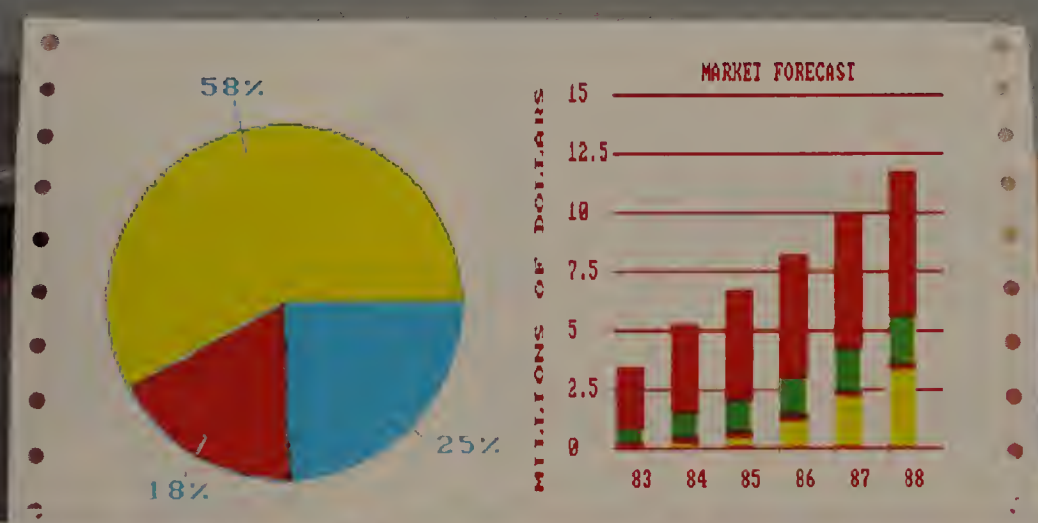

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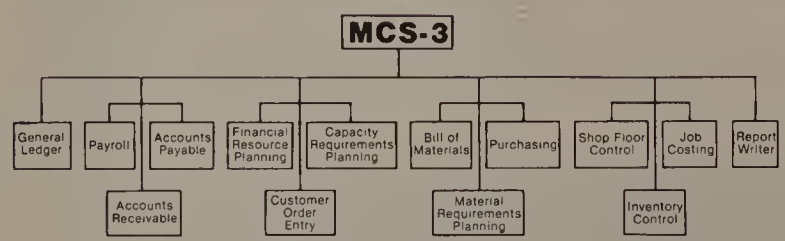

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William Urschel is a freelance writer and the author of Ready-to-Run Accounting, *a book and disk accounting package for* 1-2-3 *and* Symphony *users from Alfred Publishing.*

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Maximum scientific digits of accuracy. (COS, SIN, ATN, LOG, EXP etc.)	6 to 54 selectable by the user	11 Binary BCD N/A	16	16	6
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Sieve benchmark (Byte January 1983, 10 iter's)	13.7 sec.	14.1 sec.	14.9 sec.	261 sec.	2190 sec.
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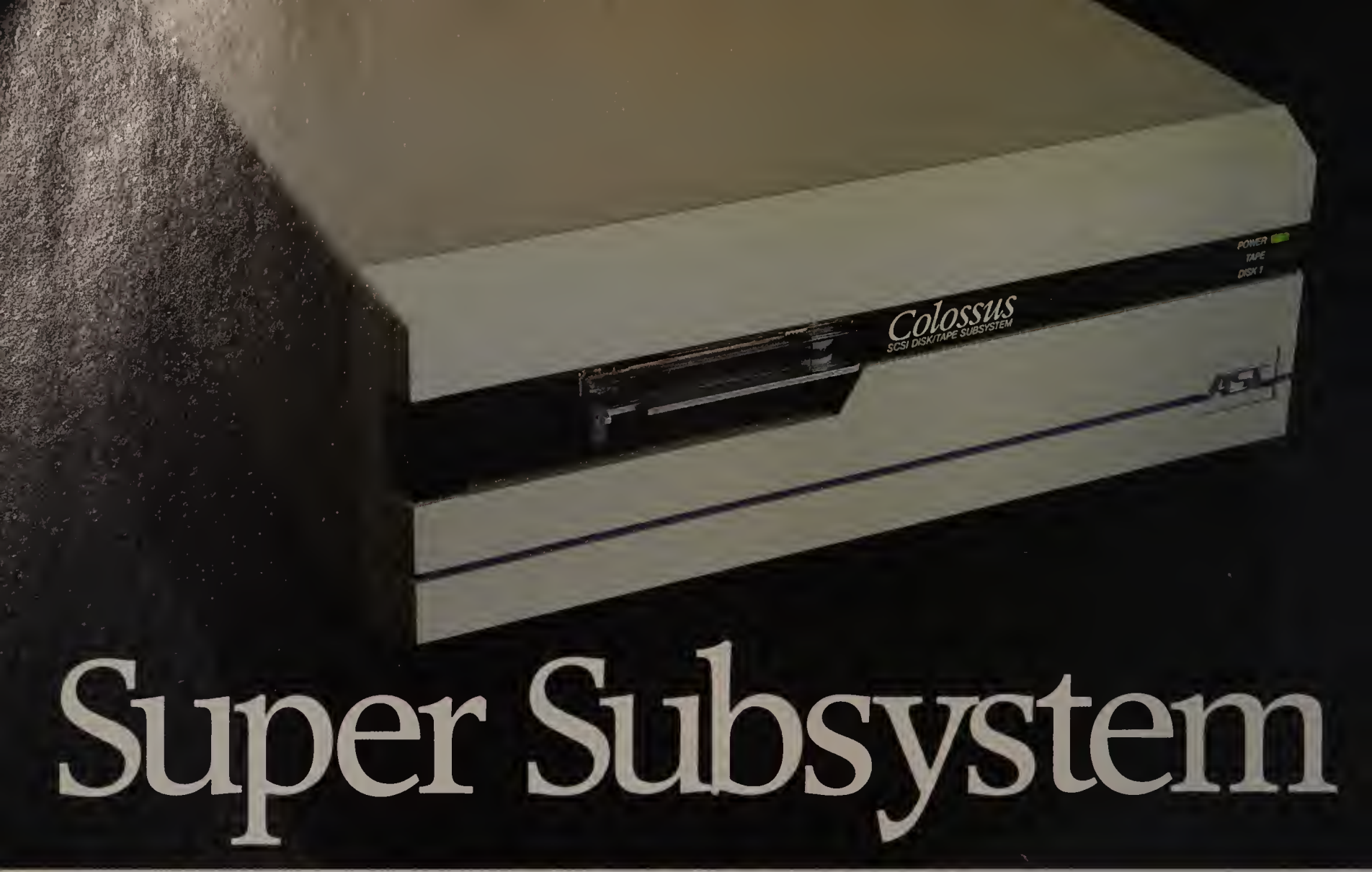

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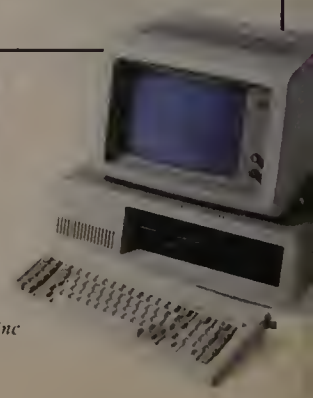

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From the Hardware Shelf

PC World offers first impressions of recent hardware releases

This month we doubly supercharge the PC and check out Kaypro's off-the-rack PC clone.

Edited by Robert Luhn

PC Turbocharger

It was a turbo kinda day. I slept right through my turbotime alarm clock and woke up late for work. I had to hurry; otherwise, I'd miss a demonstration of Univation's PC Turbocharger board. Shifting into overdrive, I tossed a few slices of bread into my turbotoaster, charged up my turbo-Mr.Coffee, and jumped under my turbo-massage shower.

But even after breaking several FAA regulations in my burgundy turbocharged T-Bird, I discovered I was too late. My co-workers had already eviscerated my IBM PC and were in the process of extracting its humble gray-matter-on-a-chip, the 8088. "What are you you doing?" I fairly bellowed. "That's my computer you're dissecting!"

"Calm down, Eric," said Associate Editor Robert Luhn, holding the 8088 up to the light with his chip-removal tool (a cleverly disfigured fork tine). "We're installing the new PC Turbocharger board with its own 8086. You'll double your PC's performance without sacrificing compatibility. That ain't chopped liver."

As I started to lose control, strains of "Swing Low, Sweet Chariot" swelled in the background. I yanked my nonexistent saber out of its imaginary scabbard and wheeled it over my head. "Give me back my chip, you swine!" I lunged for my faithful 8088, only to be physically restrained by several sleepy editors.

"Darn it, Eric, you've always wanted AT performance, and now that you're getting it, all you can do is complain." Robert cast me a withering look and turned on his heel. "Wipe the foam off his mouth and get rid of that polyester jacket. We're dealing with static-sensitive chips here."

After a few minutes, I pulled myself together and loaded my favorite slugabed word processor, *WordStar*. Everything looked familiar, yet I noticed an immediate difference: My commands were heeded in lightning-fast fashion. I tried program after program–from *Framework* to *1-2-3*, the story remained the same. My PC had assumed AT-like powers.

I quit complaining and dug into Univation's remarkably lucid documentation to see how the PC Turbocharger worked its sleight of RAM. Unlike coprocessor boards (see the PCturbo-186 review in this column), which share computing

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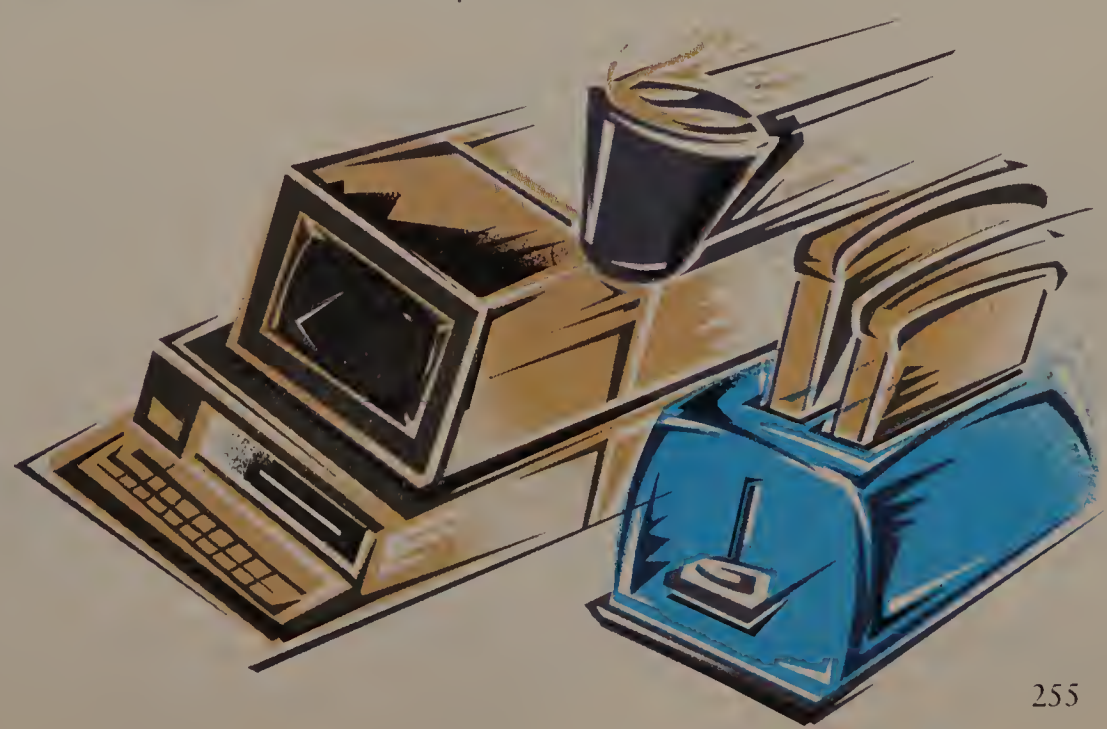

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We did market studies and calculations. We consulted with experts. We drew charts and graphs. We used the finest spreadsheet programs money could buy. When it came right down to it, we still didn't know what to sell ProDesign II for. $2995? $2495? $1995? We even considered $995.

Then, in the great American tradition, we said, "AW . . . WHAT THE HECK! Let's see the other guys beat this price!" ProDesign II costs $299. At that price, you can't go wrong!

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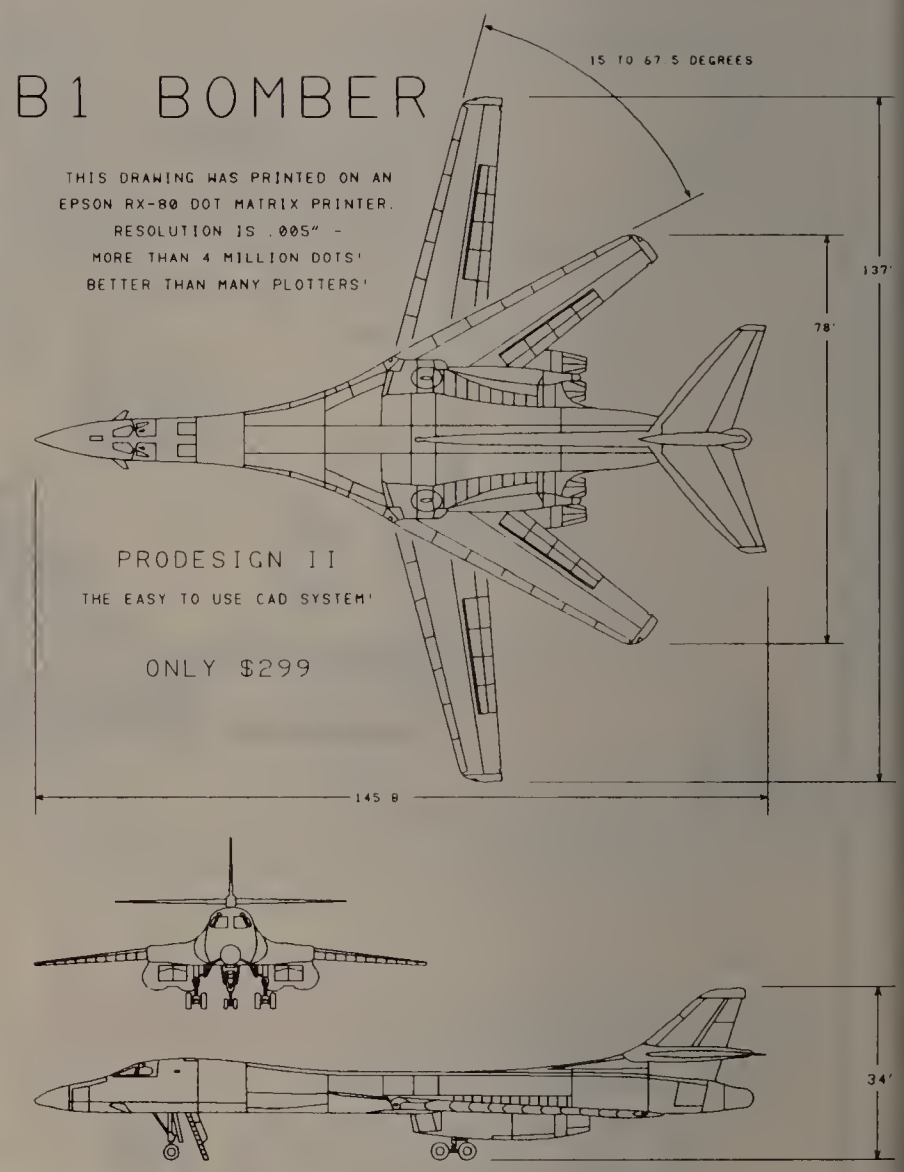

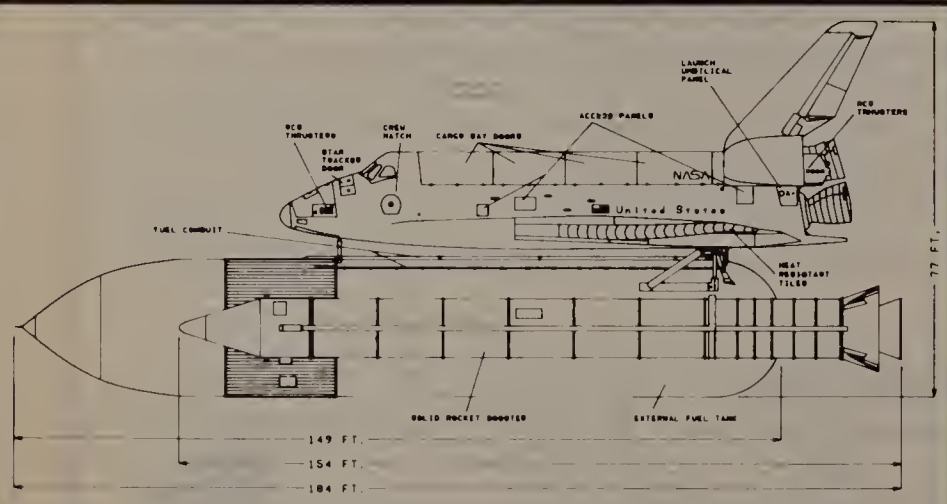

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chores with the PC's native 8088, the PC Turbocharger's 8086 replaces the 8088. Because the 8086 transports data 16 bits at a time (versus the 8088's 8-bit approach), programs run much more quickly. Univation has further sped processing by using a special 8086 that runs at 10MHz—more than double the clock speed of the PC's 8088. Consequently, you can expect most programs to work doubly fast (see Table 1). For programs particularly sensitive to the 8088's timing, flipping a switch on the back of the board slows the chip down to the 8088's snail's pace.

PC Turbocharger comes with either 512K or 640K and includes RAM drive and print spooling programs. The board also has a place for a 10MHz 8087 coprocessor for further speed gains. (*Framework*, for example, takes advantage of this chip.) You can buy the Univation board with or without the 8087 installed; if you already have an 8087, remove it from the motherboard and place it on the PC Turbocharger board. Keep in mind that most 8087s on the market are 5MHz versions and will work with the board only in 8088 mode.

Despite my initial, vocal misgivings, my only enduring reservation concerns the PC Turbocharger's inability to use previously installed memory. Your old RAM lies dormant unless the board is working in 8088 mode. And don't expect your printer, modem, or disk drive to speed up. These are all 8-bit devices, and the PC Turbocharger automatically downshifts for these and other standard peripherals.

Once upon a time I dreamt of having my own AT, but now I've shelved such expensive notions. I don't do much multitasking, let alone multiusing, and I already have an external 20MB hard disk attached to my PC. The only compelling reason for getting an AT is its faster processing. With a PC Turbocharger, that need is answered—and unlike an AT, my machine can use almost every PC program on the market. Besides, I'm a good consumer: I'll buy anything

Table 1: The turbo boards square off.

	640K IBM PC	IBM PC AT	Orchid PCturbo-186	Univation PC Turbocharger
Processor(s)	8088	80286	80186 and 8088	8086
Reformatting a 36K WordStar document	2:07	2:22	1:19	1:11
Recalculating a 46K 1-2-3 spreadsheet	2:01	0:46	0:49	0:46

(continues)

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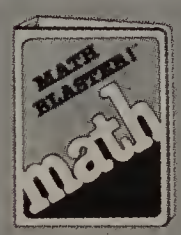

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that has the word *turbo* attached to it. I'm not really sure what *turbo* means, but no matter. I guess I'm just a turbo kinda guy. –*Eric Brown*

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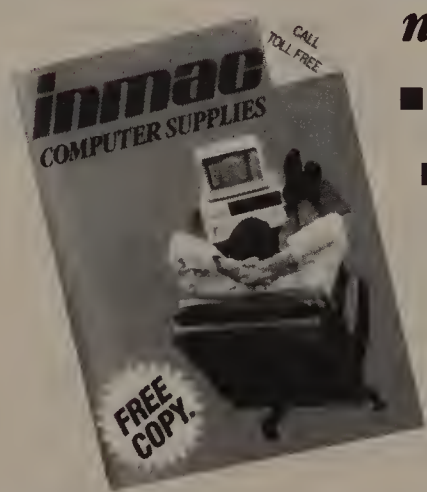

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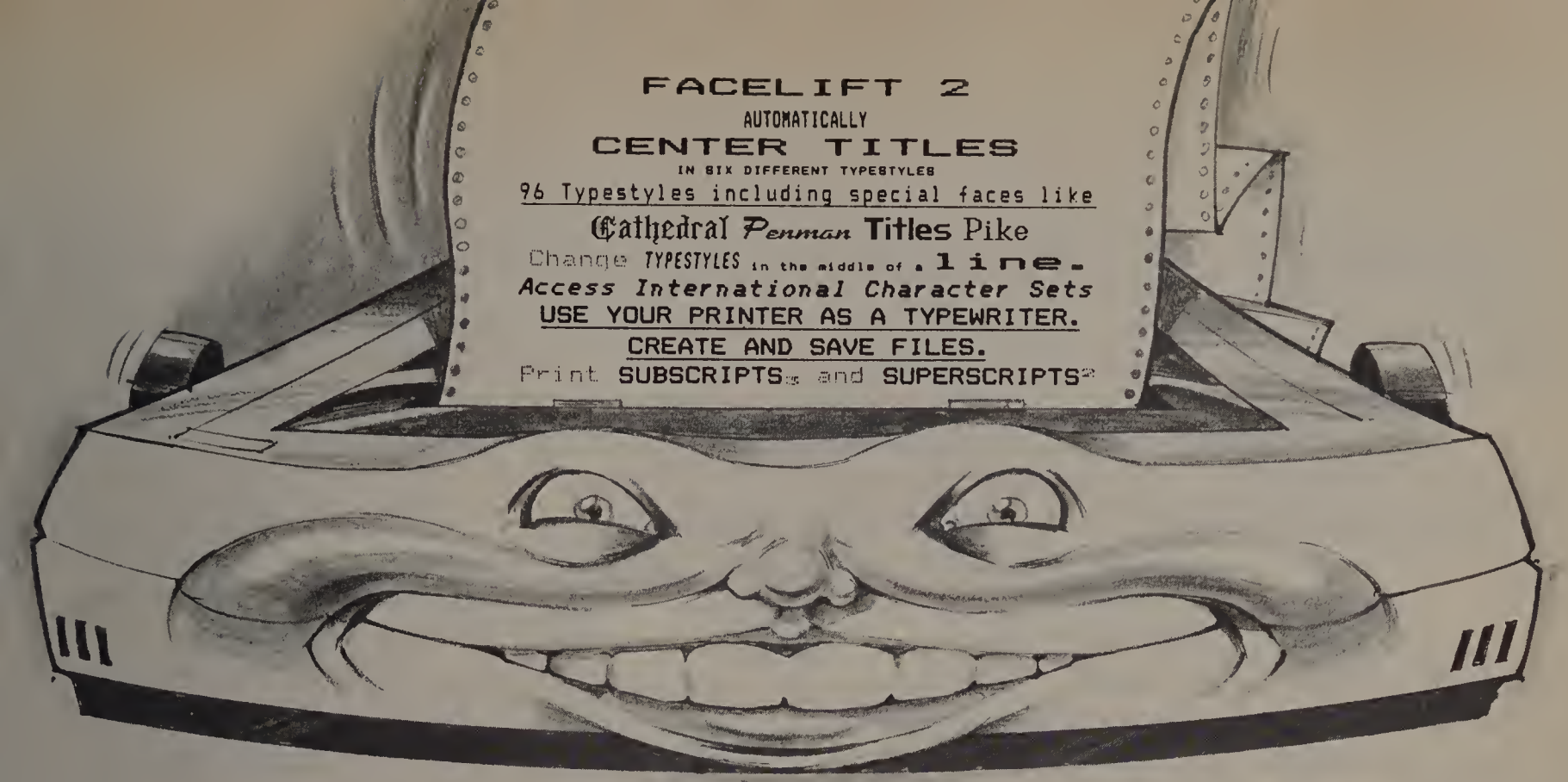

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sports a serial port, a parallel port, a composite video connector, and a single expansion slot. (The serial port is a 9-hole D connector, unlike IBM's 25-pin D connector. Don't let anyone sell you an IBM-standard serial cable.) The Kaypro 16 comes bundled with MS-DOS 2.00, GW BASIC, and a full complement of MicroPro software, including *WordStar, MailMerge, CalcStar* (a spreadsheet), *InfoStar* (a data management program), plus *Mite* communications software and program tutorials. All this and rugged styling for $3295.

The Kaypro 16 could be the most benign hard disk machine around. To set up the hard disk you simply turn on the computer, insert Kaypro's Autoload Diskette #1, follow the prompts, copy *WordStar* and the rest of the programs onto the hard disk, and reset the system. Once that's done, you're presented with an opening menu that lists available programs and features; space is reserved for on-screen help and system prompts. Hard disk directories are already allocated, with each application assigned to a separate directory. Select a program from the opening menu—the system finds the appropriate directory and loads the application automatically.

In addition to quick and easy access to programs, the menu offers Utilities, a disk tutorial that leads you through commonly used DOS utilities. BACKUP is also available from the opening menu, giving this DOS utility unwonted but well-deserved prominence.

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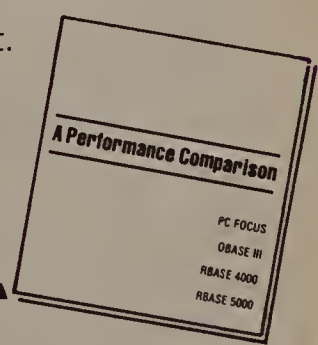

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Kaypro's menu system and user manual cleverly hide the more arcane workings of DOS and the computer. The breezily written manual includes basic information on DOS and the computer but devotes a scant four pages to directories. Separate manuals are included with each bundled application. It all seems so simple—at first.

Though I use *WordStar,* I'm not particularly fond of its MicroPro siblings. I use *1-2-3, dBASE II,* and sometimes *Microsoft Word.* And while menu systems are helpful when you're starting out, I prefer the convenience and speed of an AUTOEXEC.BAT file, which can automatically load a RAM disk program and my word processor when I turn on the machine. I immediately disabled the menu system when I discovered to my chagrin that it recognizes only the programs bundled with the Kaypro 16. Since portables are often adjuncts to or replacements for desktop systems, it's curious that Kaypro assumes you won't have your own software preferences. Unless you are devoted exclusively to the MicroPro family of software, dispense with this window dressing.

As hard disk compatibles go, the Kaypro 16 can hold its own in the performance and noise categories. The keyboard matches the IBM PC's layout, with the addition of LED <CapsLock> and <NumLock> keys; response is snappy enough for most typists. Because the Kaypro uses a graphics-oriented monitor, text is a little fuzzy. I've also encountered compatibility problems with a few copy-protected programs, but most off-the-shelf software for the PC works flawlessly.

In the final analysis, the Kaypro 16 does the job and for less. It's portable, compatible, and affordable. If you're starting out and you're comfortable with the MicroPro family, Kaypro's menu system is definitely a great help. Add a modem, and this could be the only system you'll ever need. *—Darcy DiNucci*

Kaypro 16
Kaypro Corp.
533 Stevens Ave.
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List price: $3295

PCturbo-186

When I was in high school, I had three close friends. We did everything together, from night-before-finals cramming to detention-hall meditations. We also made up our school's four-man, 440-yard relay team.

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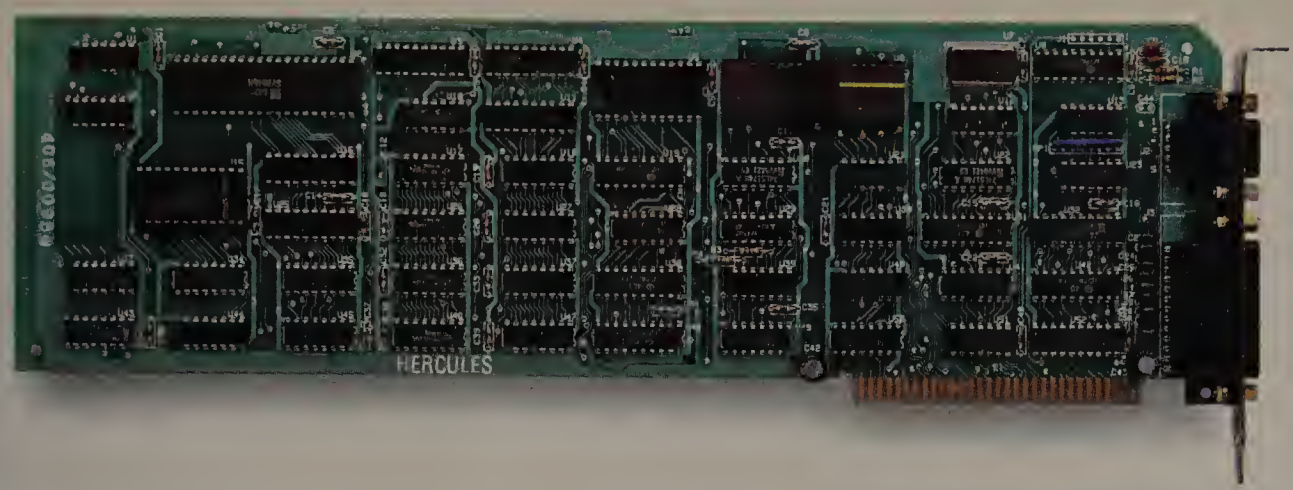

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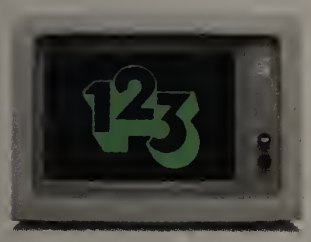

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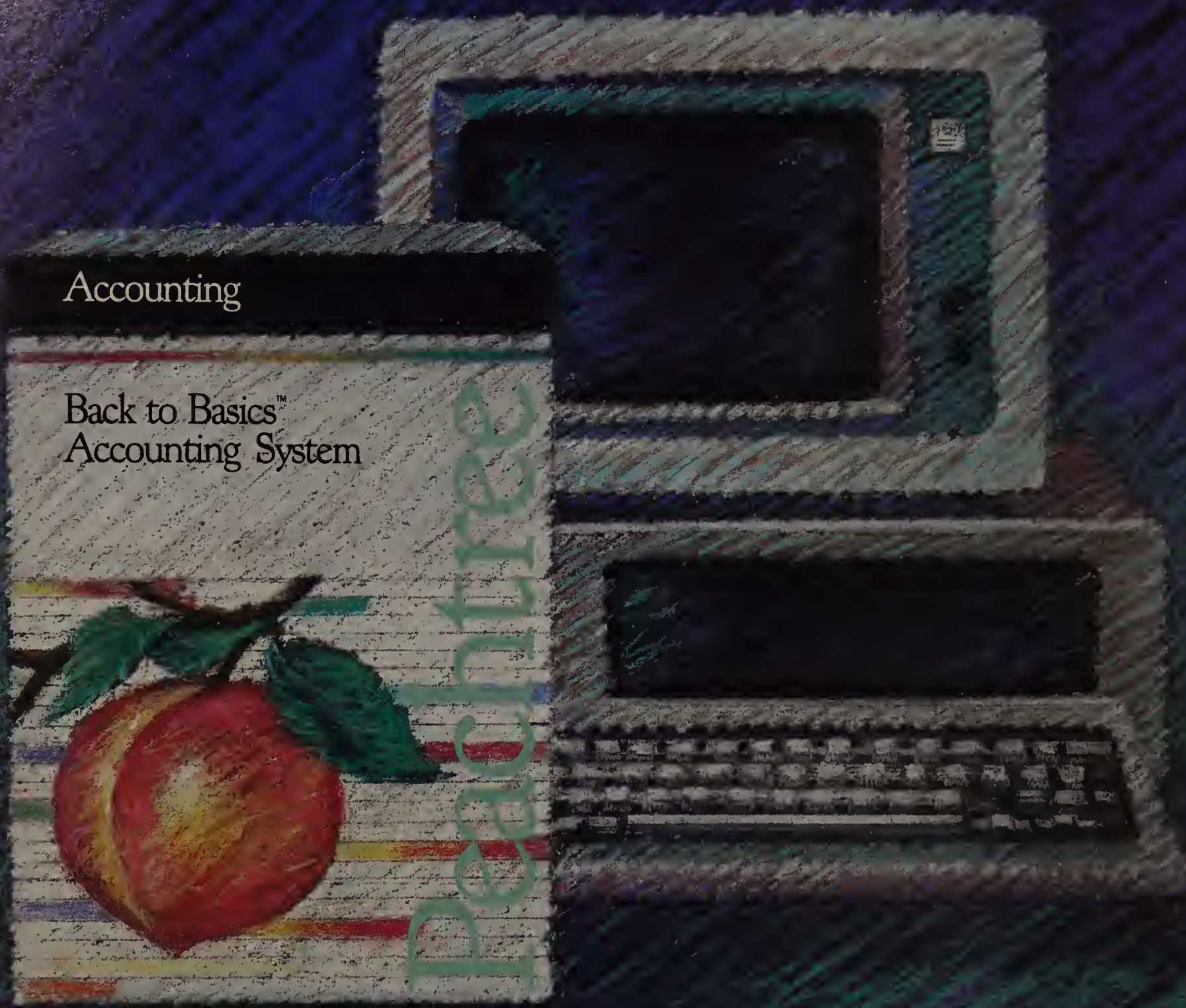

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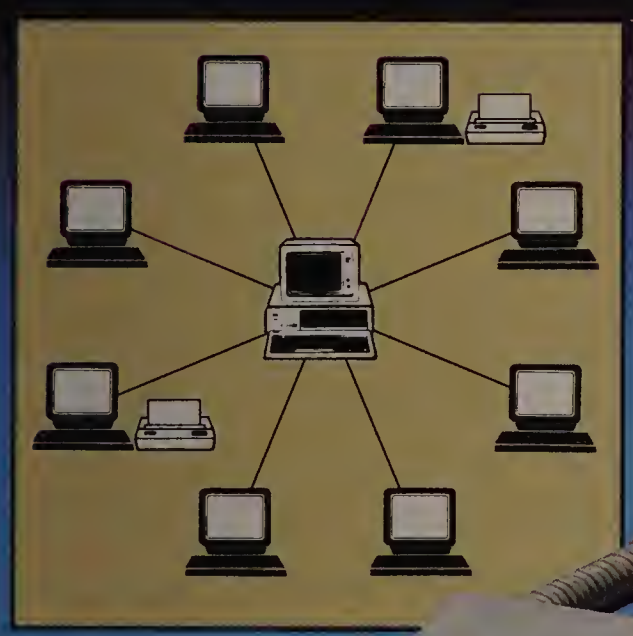

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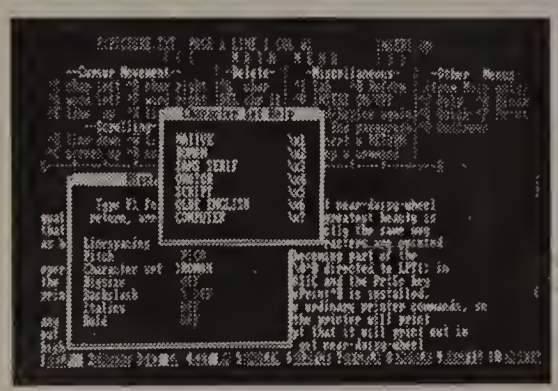

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Circle 456 on reader service card

By contemporary computing standards, the PC is no Carl Lewis—but there are ways to slap some extra processing muscle onto your lean machine. One approach is to use the PCturbo-186 accelerator board from Orchid Technology, which features Intel's speedy 80186 microprocessor. Under the aegis of some special software, the board works in tandem with the 8088, transforming the PC from weekend jogger to speed racer.

Orchid's offering is practically a computer-on-a-board: the 80186 is outfitted with its own BIOS ROM chip and entourage of RAM. The board initially comes with 128K RAM but actually requires 256K; an optional daughterboard can boost the retinue to 640K. The entire package barely fits into one full-size expansion slot. Installation involves adding a CONFIG.SYS file to your DOS disk and inserting the board; switches are set at the factory.

Though the 80186 is a speed demon (in large part because of its 16-bit data bus and 8MHz clock speed), the team concept is what enables these chipmates to shave extra seconds off typical processing tasks. The faster 80186 concentrates on programs and directs the 8088 to field the input/output requests from peripherals such as disk drives, printers, and monitors. This collaboration is buttressed by Orchid's RAM disk caching software, which keeps track of frequently used data on disk and anticipates when that information will be needed by an application. The overall result is faster program execution.

(continues)

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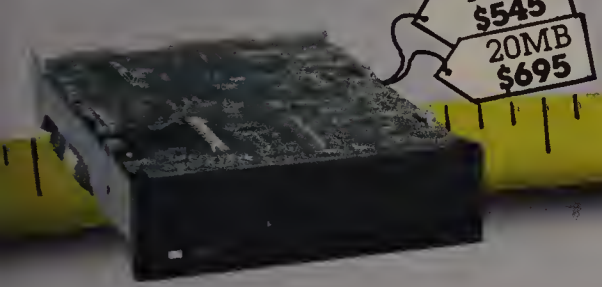

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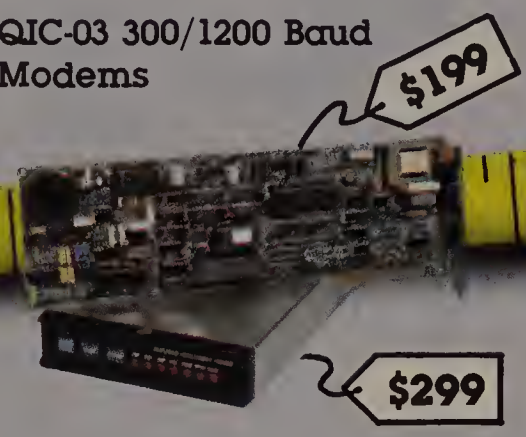

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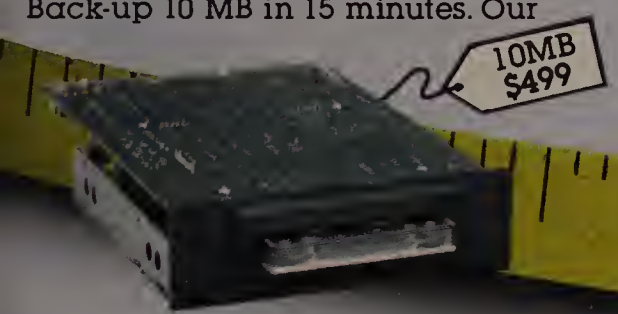

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When a PC with the 640K PCturbo-186 was pitted in speed tests against an unmodified PC with the same amount of memory, it was no contest (see Table 1). I found I could zoom from the top to the bottom of a 36K *WordStar* file or recalculate a 45K *1-2-3* spreadsheet in a flash with my beefed-up PC. For programs and peripherals inexorably dependent on the 8088, PCturbo-186 software switches the board from turbo to an 8088 mode.

A couple of caveats for speed-hungry users: As with Univation's PC Turbocharger, the PCturbo-186's RAM becomes the PC's system memory; although in this case previously installed memory is used for RAM disks, print spooling, and caching. Both the PCturbo-186 board and the PC must also each possess at least 256K to function properly. Orchid sells the basic board with 128K and suggests that people with at least 384K in their PCs transfer some memory chips to the PCturbo-186 board.

But speed is the issue here, and that's what you get with Orchid's team player. –*Wes Nihei*

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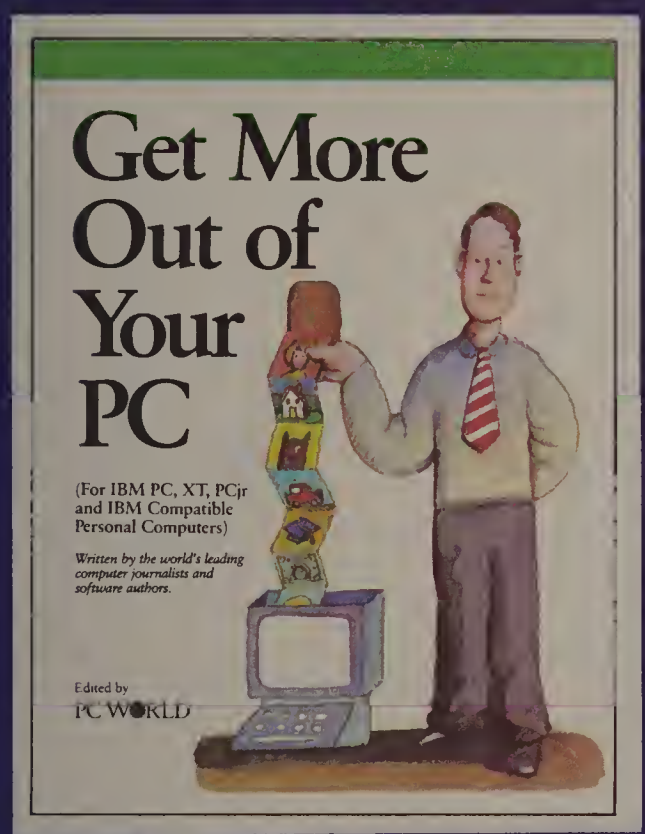

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Password: Communicate

Insights and information on the PC communications marketplace

This month: The AMA steps out into the competitive medical on-line services industry, IBM and AT&T step into each other's territories, and bulletin boards step up into long-distance electronic mail with Fido

Edited by Eric Brown

On-Line

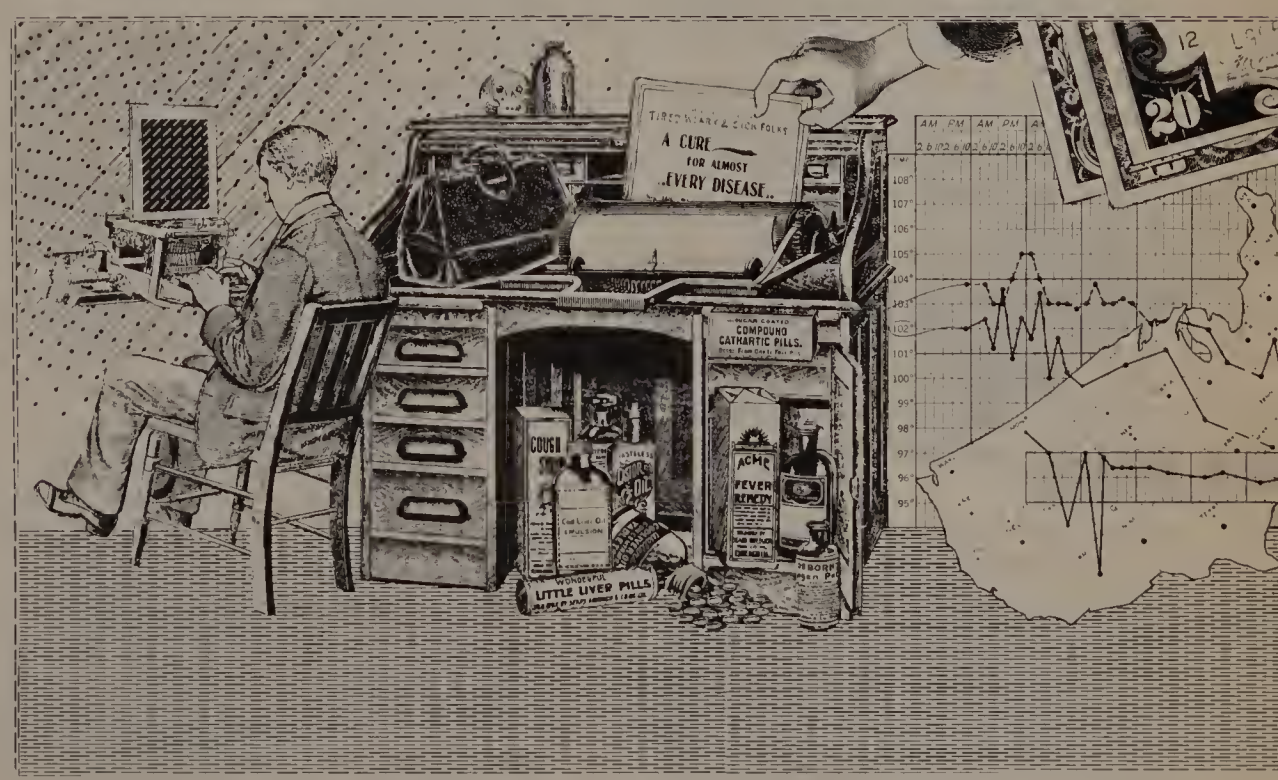
The AMA's Medicine Show

Its launch was dampened by mixed reviews. Skeptics said that although it managed to get off the ground, like Howard Hughes's Spruce Goose it would probably never soar. But in the three brief years since its inauguration, the American Medical Association's Medical Information Network (AMA/Net) has surprised critics and believers alike with an ever-expanding list of services, a soaring number of subscribers, and a strong position in the competitive medical on-line services industry.

Although current users of AMA/Net still total no more than the circulation of some of the lesser journals in the AMA publishing empire, the network's 20,000 subscribers represent a 50 percent increase over the number of subscribers of just one year ago. Next year AMA/Net will go international, offering service to physicians in Japan, the United Kingdom, the Netherlands, and several other countries as yet undisclosed.

AMA/Net offers many of the data bases found on its competitors' services, such as medical abstracts, literature-searching services, a drug data base, and a quick-reference disease data base. It also offers a special bibliography for articles on medicine's social concerns in areas such as ethics, legislation, and economics. But the network's main attractions for physicians are its daily-updated medical news services and its broad scope of communications capabilities. A physician who signs on to AMA/Net can have direct access to the surgeon general's office, the Food and Drug Administration, the Atlanta Center for Disease Control, and the public health organizations of all 50 states. He or she can file reports

(continues)



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"MY SECRET LIFE AS A WRITER"

by "D", Investment Banker

I was always just a banker. Someone who used his computer for things like budgets, projections, and turning numbers into pie charts.

Until one night, I got this uncontrollable urge. Suddenly I had to write. And I had to write fast.

Calmly, I took the Word Result disk from my secretary's desk. I was ready to enter the world of word processing.

I put the disk in my computer. As commands appeared in plain, simple English, I learned how to add, delete, rearrange.

Whenever I got stuck, I just pushed the *Help* button. Instructions telling me exactly what to do would appear on the screen. It was all so simple.

I typed a title on the screen. "The Chick From Fresno." The novel I'd been carrying in my heart for years was finally taking shape.

The next day I bought a Word Result program of my own. I put it in my computer along with my spread sheet program, Calc Result. Now I can switch back and forth when nobody's looking. Sometimes I even split the screen and do both at once. But I have to be careful the chick from Fresno doesn't end up in the middle of some budget.

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with the FDA on adverse drug reactions, obtain excerpts from public health reports, and learn the latest on outbreaks of various diseases. Physicians can even earn continuing education credits through interactive programs developed by Massachusetts General and Harvard Medical School.

"Doctors are just becoming aware of the information that can be accessed with a computer," says Dr. Byron Oberst, a Nebraska pediatrician and chairman of the American Academy of Pediatrics' Section on Computers and Other Technology. "I've used AMA/Net an uncountable number of times in the past year for researching journal articles, researching information on diseases, and sending electronic mail. It's become an integral part of my practice."

Other physicians are less enthusiastic about the network. Says one physician who prefers to go unnamed, "Frankly, I haven't been all that impressed with what AMA has to offer. Their data bases are inferior in quality. The indexing is poor. They cost three times more than they should. What I need is something to help me use the library and make it fun and easy. Dialog's Knowledge Index does that. BRS's Colleague does that. AMA/Net doesn't."

Knowledge Index, a simplified version of Lockheed's Dialog, and Medical Colleague, a joint venture of Bibliographic Retrieval Service (BRS) and the medical publishing house of W.B. Saunders, are AMA/Net's most well-entrenched competitors. Although neither can compete with AMA/Net's networking capabilities, both are acknowledged heavyweights in the area where AMA/Net falters: volume and variety of data bases. Both provide a vast number of medical data bases, in addition to the National Library of Medicine's bibliographic data base, Medline. BRS's Colleague also stands out as one of the few on-line services that offer the complete text of medical books and journal articles, a service that the AMA doesn't provide

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even for its own publications. Instead, the AMA licenses out rights to full-text electronic publication of its journals to Mead Data (NEXIS).

Medical Colleague, which was introduced just last year, and Knowledge Index have become popular among physicians who need a complete research library at their fingertips. Since both lack any networking capabilities, however, many physicians who subscribe to one or the other also subscribe to AMA/Net.

Although AMA/Net has a long way to go to catch up with its competitors, as the official network of the AMA the service has a strong advantage. In a recent promotional campaign, the AMA exercised its political clout by bringing 68 health professional societies on line. By offering the societies reduced group subscription rates, their own special bulletin boards, direct access to their members through electronic mail, and other incentives, the network not only significantly increased its number of subscribers but extended its influence well beyond the scope attainable by a private purveyor of on-line services.

"We've exploited every avenue we can," says Daniel K. Harris, director of AMA/Net. "Every time we can do something new in medical communications, we do it."

The AMA plans to add more data bases, special services, and linkups to health organizations. According to Harris, plans are in the making to develop interactive programs for diagnosis and therapy and to introduce a service to file paperless insurance claims. In addition, the AMA plans to design a line of PC communications software especially for its network.

The AMA is even considering branching out from its strictly vertical market audience to include services for the general public. Already, there are plans for interactive programs on personal hygiene

(continues)

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and health education for children. Along with its current networking capabilities, this broadening of AMA/Net's audience would distinguish the service from its competitors, transforming it from a medical research library into a multipurpose health network. If AMA/Net continues to provide unique services, while improving their indexing and ease of use, this newcomer may be around for a long time. –*Judy Getts*

Watson Watch

As the Giants Circle

Everyone knew it would happen. The only question was when and where. Although IBM's summer announcement that it would sell its 60 percent ownership rights of Satellite Business Systems (SBS) to MCI Communications Corporation in exchange for a 16 percent stake in MCI came as no surprise to many analysts, the agreement's impact is still creating shock waves. Over the next three years IBM plans to acquire up to 30 percent of MCI and invest $400 million in the carrier's network expansion.

MCI, heretofore a faltering, remote second to AT&T in the long-distance carrier industry, will undoubtedly receive a major boost from the agreement, in both financial and technical support. IBM has clearly picked MCI out of the chorus line of small carriers and cast it to star opposite AT&T. Yet this reshaping of the market should provide more immediate headaches for the smaller carriers, such as GTE SPRINT and Allnet Communications, than for AT&T (see Figure 1). For IBM the agreement signifies the first major step into telecommunications since its acquisition of Rolm, and a long-awaited move in everybody's favorite master plan–the unification of the telecommunications and computer industries.

The deal also underscores the trend of telecommunications companies moving beyond long-distance telephone service into the more potentially profitable area of data communications via digital networks. IBM's investments should accelerate MCI's already extensive implementations of optical fiber and digital microwave networks. The merging of SBS's satellite links into MCI gives IBM a foothold in all the major digital network technologies.

Meanwhile, AT&T looks on with mixed feelings. Although the IBM-MCI agreement should prove troublesome to AT&T in the long run, it might solve some problems in the near future. The new potency of MCI may persuade the Federal Communications Commission that competition is strong enough in the telecommunications marketplace to fully deregulate AT&T.

Meanwhile, AT&T hasn't been sitting around waiting patiently in the Watson wars. The same week as the MCI agreement, the telecommunications giant stepped boldly into IBM territory with an avalanche of product announcements, including tidings of new versions of the AT&T 3B minicomputer, links between the 3B

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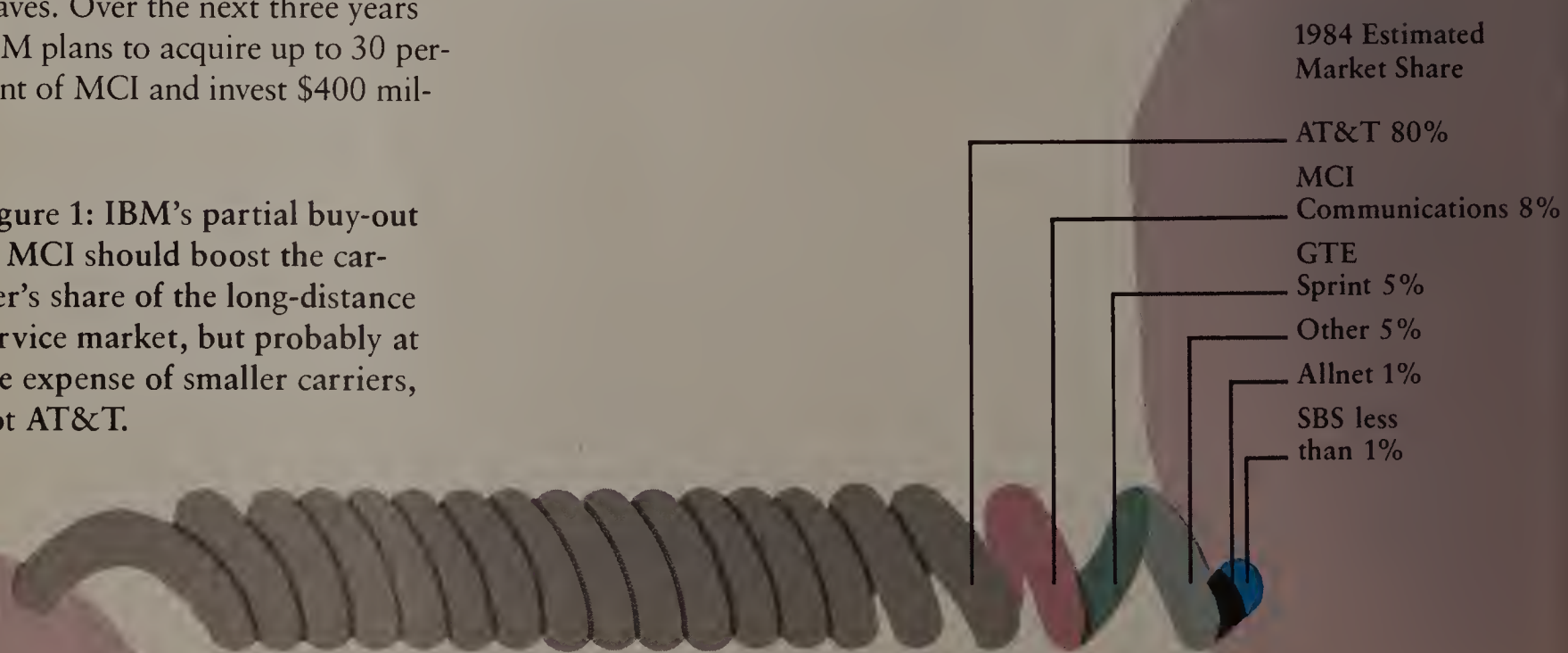
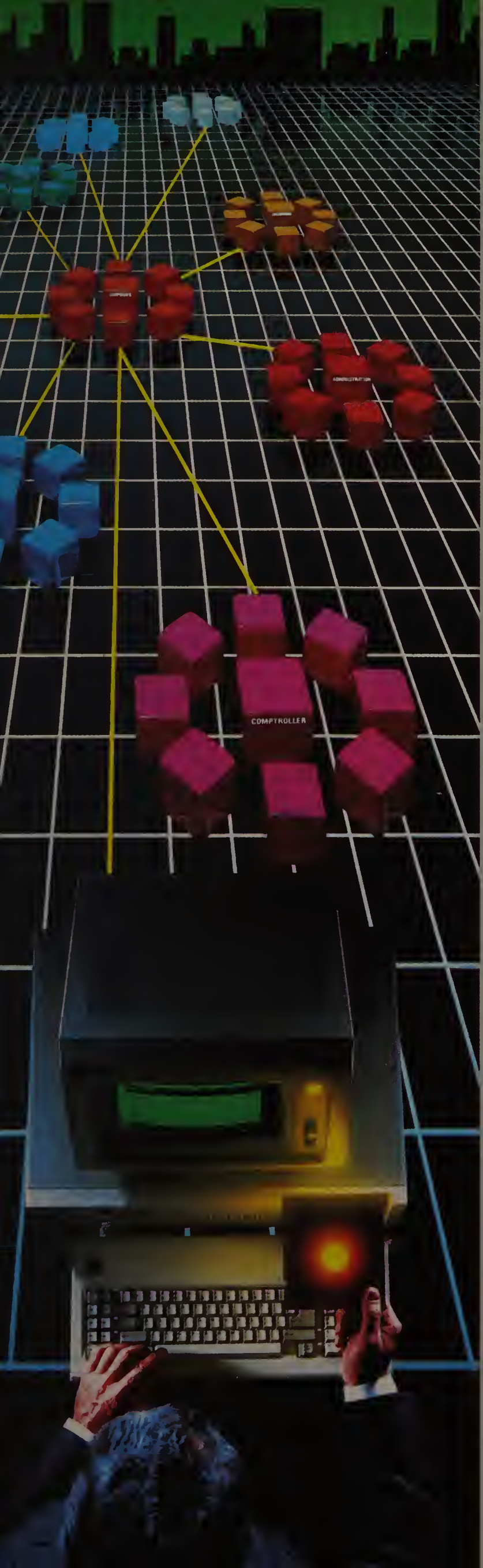


Figure 1: IBM's partial buy-out of MCI should boost the carrier's share of the long-distance service market, but probably at the expense of smaller carriers, not AT&T.



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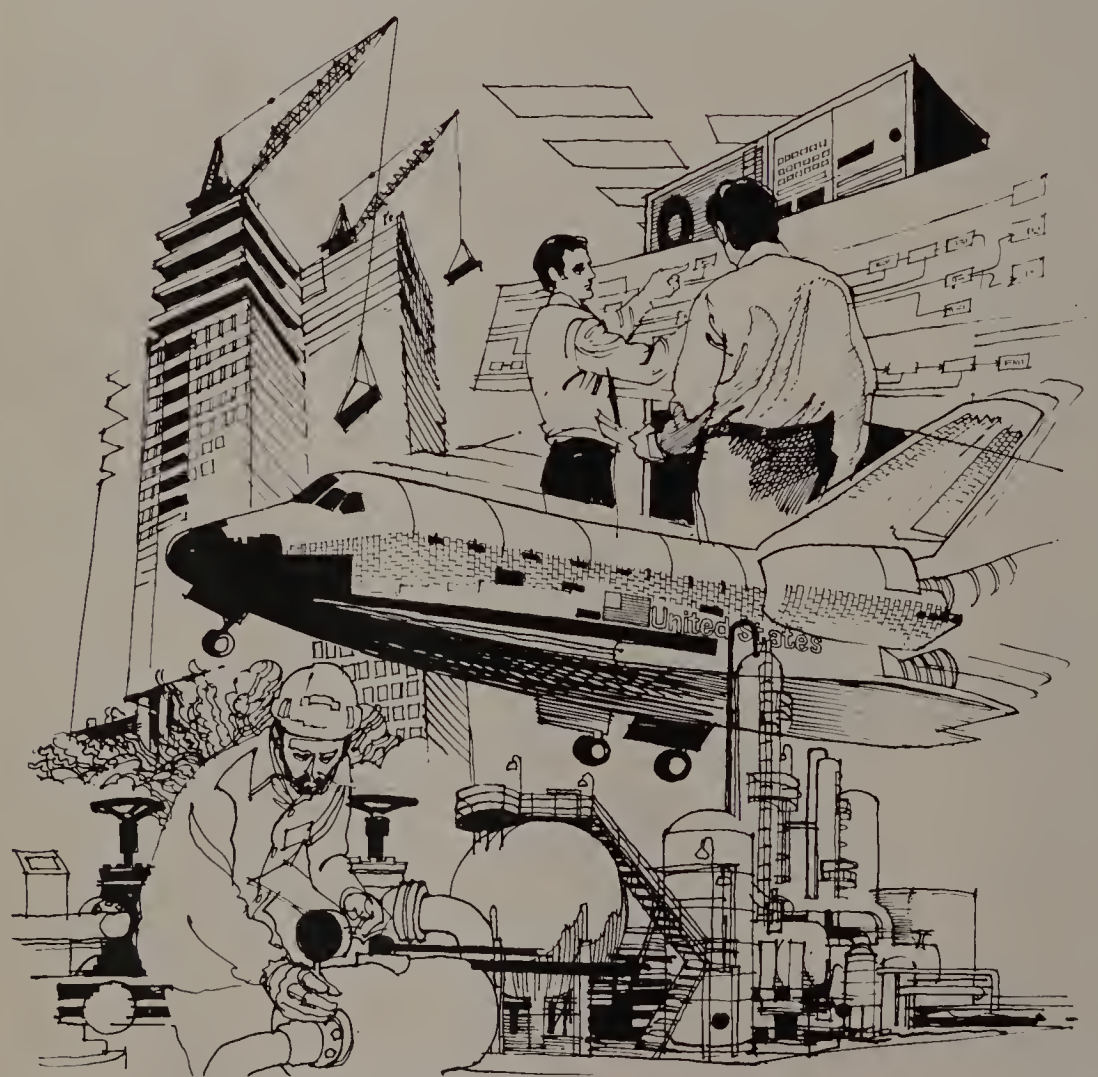

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and IBM mainframes, and a version of UNIX that runs under IBM's VM operating system. The mainframe links should help lure potential customers who have hesitated to buy AT&T systems due to lack of IBM compatibility.

And so the story unfolds as prophesied. While the two giants circle each other slowly, treading on each other's turf, smaller companies run the risk of being squashed underfoot. No doubt a number of small manufacturers are waiting for a call from AT&T that might save them from such a nasty fate. They may even answer their phone on a telecomputer.

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Circle 381 on reader service card

Nancy has grown used to kids assuming that her husband is one of them. Actually, Allen is an investment analyst with American Financial Corporation, a Cincinnati firm. Like the kids who call, Allen was bitten by the bulletin board bug. But unlike most SYSOPs, Allen set up his bulletin board system (BBS) at his office with the financial support of his company, and the board is considerably more sophisticated than the kind most kids are used to.

Allen's board (513/579-5287) is not an independent BBS but part of a network; all its members are linked by the same host software, a program that goes by the unusual name of *Fido*. A *Fido* board has many features commonly associated with other BBSs. For example, callers can leave and scan local messages, read editorials, answer questionnaires, and upload and download software. *Fido* provides three levels of help: Novice, Regular, and Expert.

But *Fido* has a special capability that distinguishes it from other systems: FidoNet. This long-distance electronic mail service can transport text or binary files to any one of the more than 150 *Fido* "nodes."

This is how *Fido* works: Allen's board accepts text from Cincinnati callers at local phone rates. Then, between 4 and 5 a.m. every day it temporarily suspends normal operations to deliver its long-distance messages. First it bundles them, and then it whisks them to their destinations.

Since *Fido* processes several messages at a time, the service is speedy, and the rates are low. In most cases the charge for any message delivered within the continental United States is 25 cents. The rates are appealing even for overseas delivery—$1 to Liverpool, England, for example, or $2.75 to Djakarta, Indonesia, currently the farthermost point of the *Fido* empire.

Although the *Fido* program itself is free, long-distance phone costs add up, and some of the costs are passed on to users. Rates and payment procedures vary, depending on the volume of mail and the decision of the SYSOP. In some cases, the SYSOP requires the user to send $5 to $25 in advance, from which deductions are made. But even this hardly covers expenses. For example, Al De La Torre, a Miami-based SYSOP (305/554-4602) who charges $25 for FidoNet, laments, "I've got $9000 worth of equipment, which generates about $200 in income." Every three months Lane Fowler of Atlanta (404/938-4808) throws a party for his subscribers, and they pass around the hat.

Currently, Allen Miller's company is underwriting many of the *Fido* board's expenses. Why does the company do it? "Primarily for

(continues)

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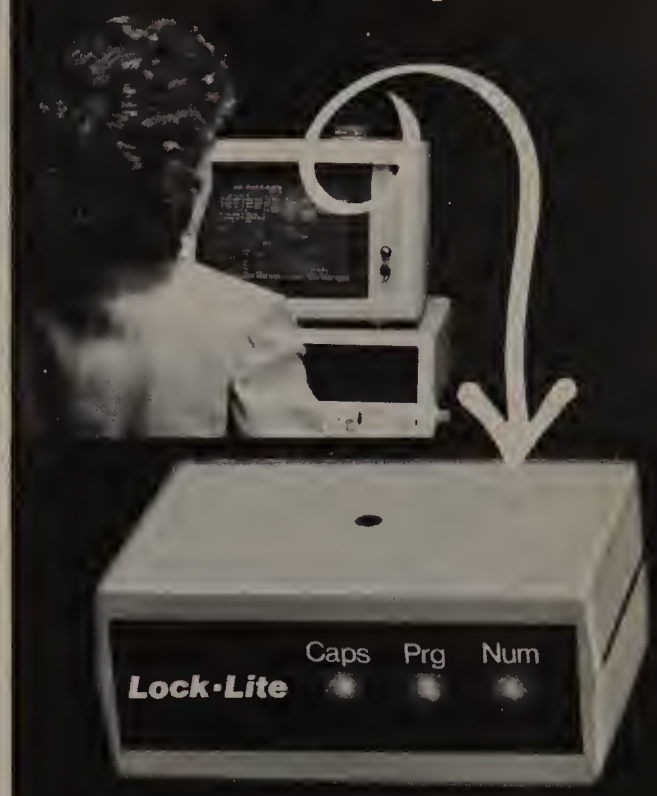

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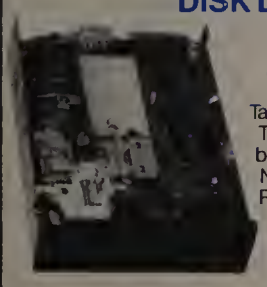

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goodwill," Allen explains. But there's also a practical reason for running the board–adapting the wealth of public domain software for use within the company. Allen's board currently contains over 1500 MS-DOS public domain programs and maintains over 800 subscribers. "With our electronic library, we're not forced to make phone calls to someone else's system to hunt down a program."

The biggest problem Allen and other *Fido* SYSOPs face is familiarizing users with the FidoNet mail service. Most of the operators enthuse over the mail capabilities and lament the meager use made of the mail service. Tony Clark (314/441-9297) of St. Louis pinpoints the problems: "First, you have to get the user to notice the mail service. Most people assume that it's just for local messages and don't investigate further. Second, since we don't have an extensive directory like The Source, users don't know who to address their mail to."

The equipment Allen has access to would make most SYSOPs green with envy–an IBM PC AT with two hard disks totaling 55MB. The system has been adapted to receive calls from two phones; if one line is busy, the system automatically transfers the caller to the other. In addition, Allen maintains a PC at home to communicate with the board at work.

(continues)

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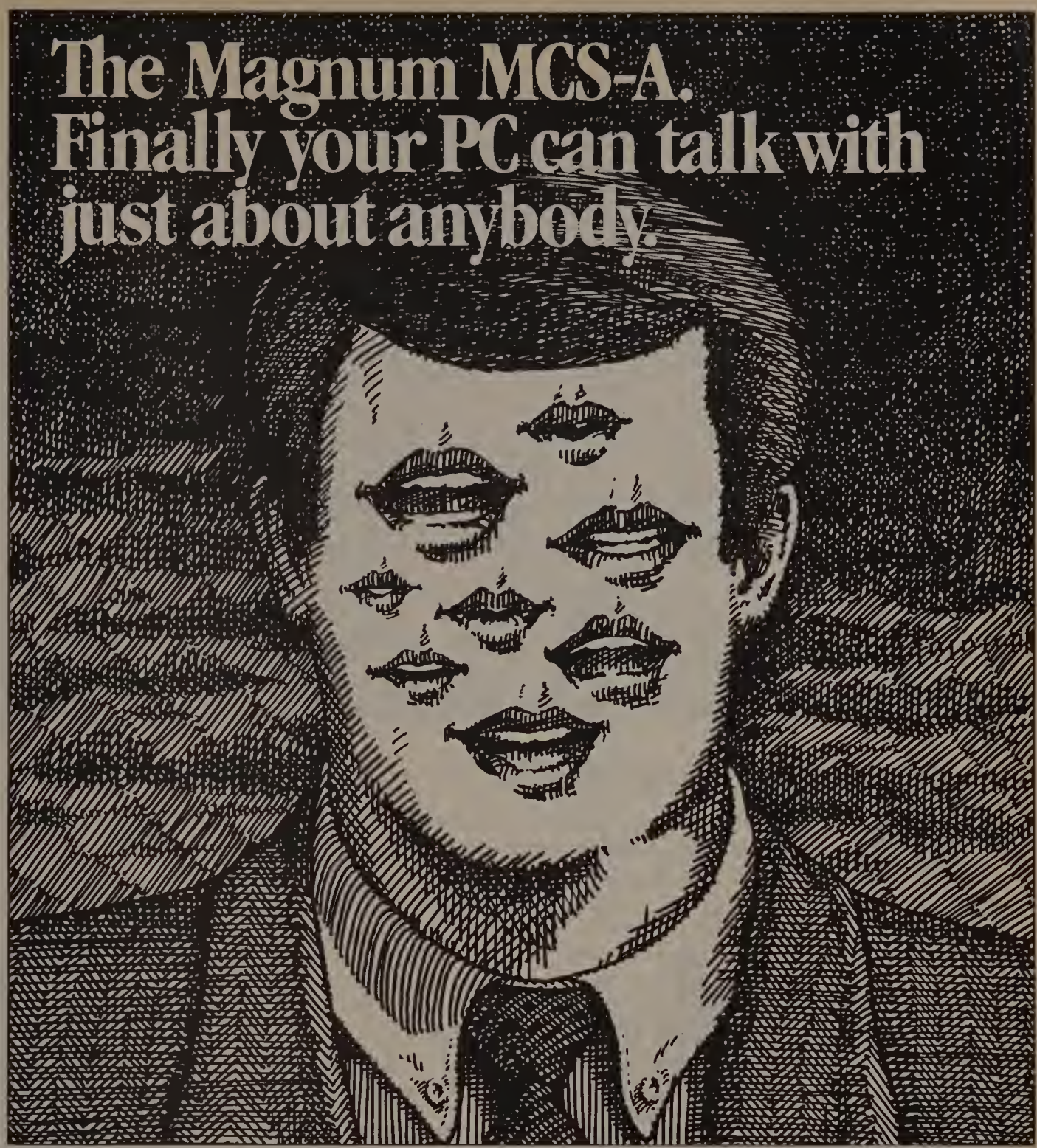

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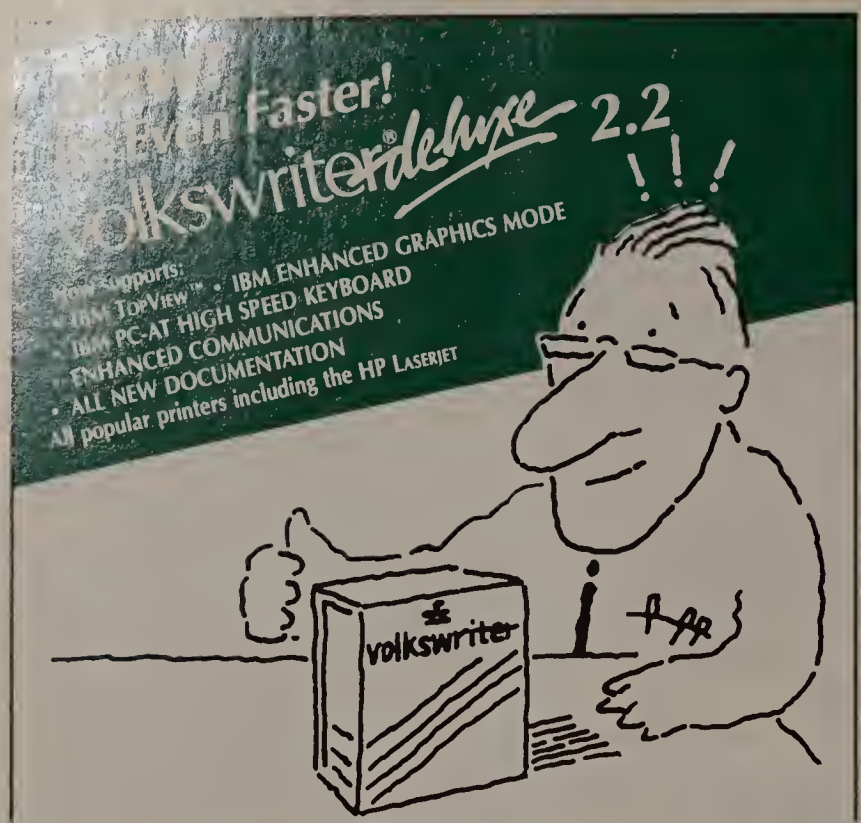

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Like any bulletin board, Allen's requires attention—about an hour a day. At 8 a.m., before the business day begins, Allen hunches over his computer to perform housekeeping functions. Only twice has he had to remove profanity. That's probably because the board operates without charge to the subscriber. It's amazing how ornery and vile users can become when a SYSOP announces a modest $10 fee to help defray expenses.

Fido's creator is Tom Jennings, who works for Phoenix Software and dwells at FidoNet1 in San Francisco (415/864-1418). In 1983 Jennings placed *Fido* in that hackers' heaven known as the public domain. The curious name of the program originated with one of Jennings' co-workers, who playfully referred to the motley assortment of components Jennings had assembled as a mongrel.

On Thanksgiving in 1983, Jennings and John Madill (301/484-2831) established the first two *Fido* boards. By May 1984 the two boards had multiplied to 20, by September to 50. Now the network comprises almost 200 bulletin boards, each with approximately 200 members, indicating a total membership of 40,000.

(continues)

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Fido has become so successful that Jennings is now attempting to extricate himself as project guru. "Last week I answered 400 messages for help. It left me numb. Thank God for Ken Kaplan and Ben Baker of St. Louis, who handle the administrative details."

How large *Fido* can grow is anyone's guess, but if you've a mind to add your own SYSOP voice to the *Fido* chorus, it's easily done. Any member of the network can supply you with the software on request. Once you have the system operational, contact Ken Kaplan (314/576-2743) at node 51 in St. Louis to be listed. Then you and *Fido* can be off and barking.
–Stan Sulkes

Judy Getts is a freelance science writer in Wauwatosa, Wisconsin. Stan Sulkes is a freelance writer and professor of English at Raymond Walters College in Blue Ash, Ohio.

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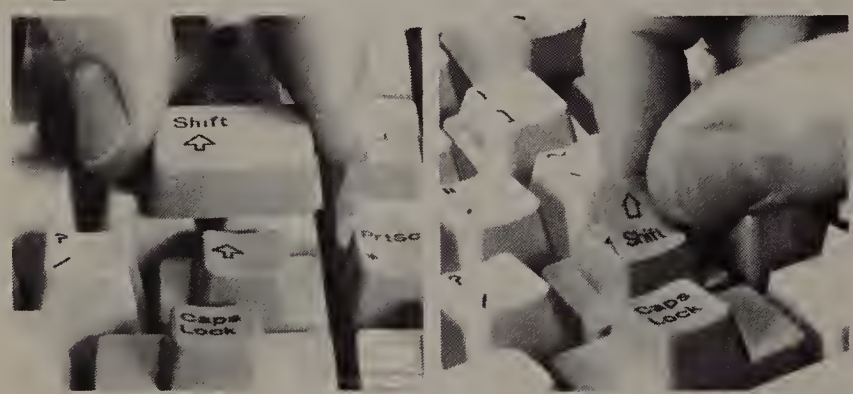

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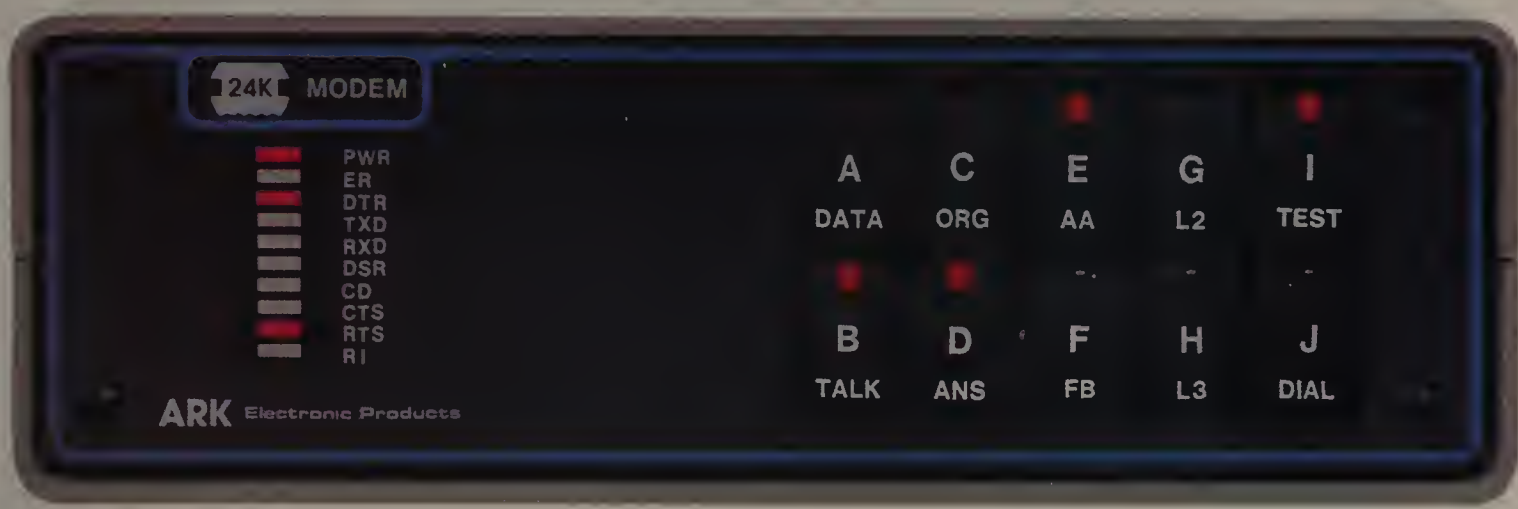

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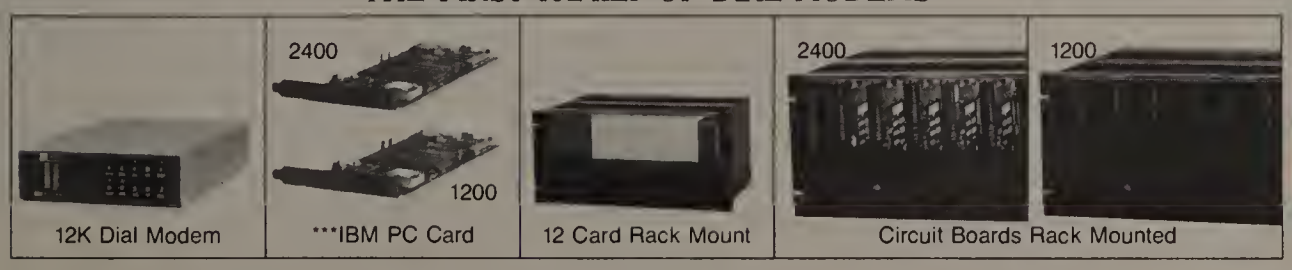

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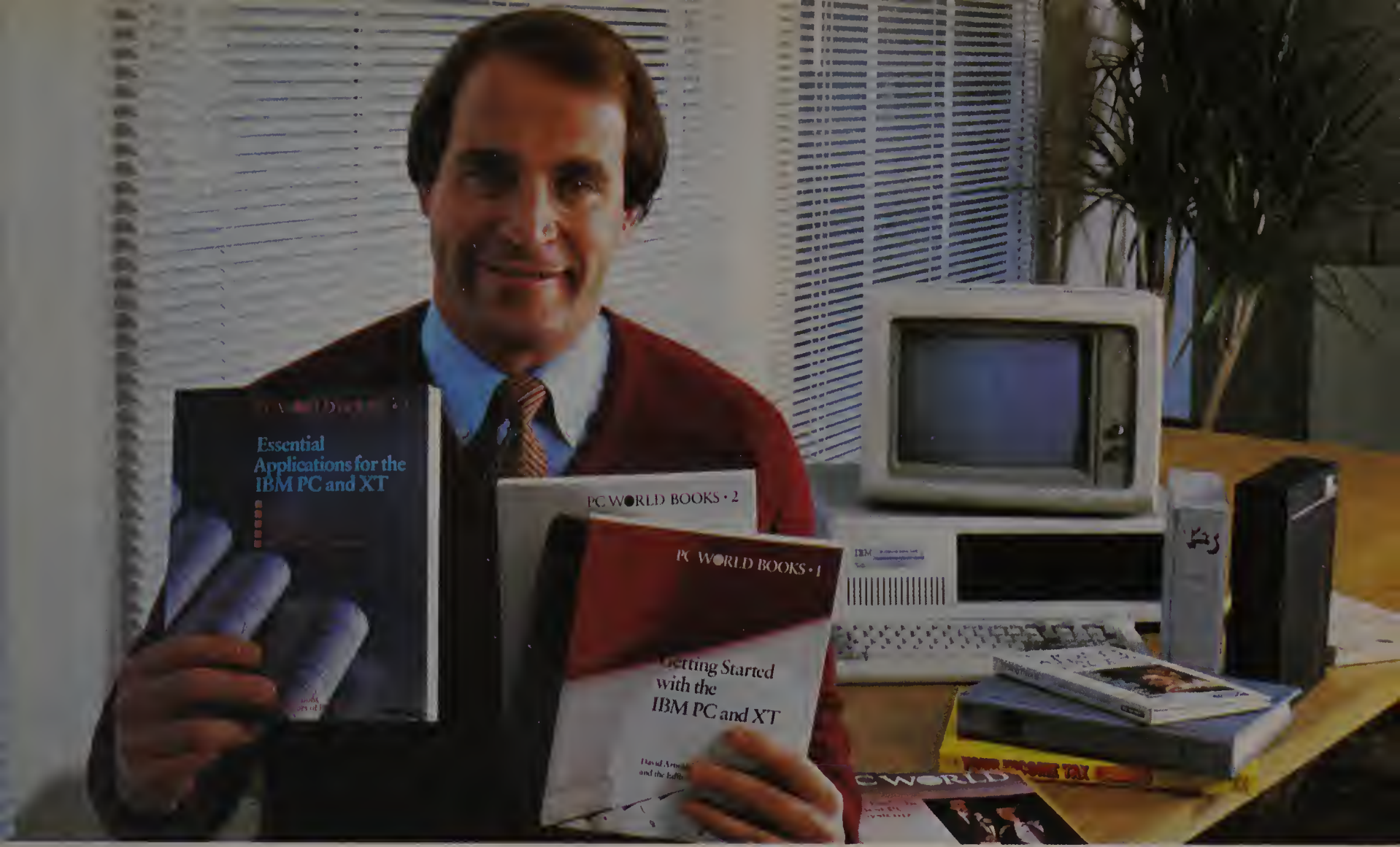

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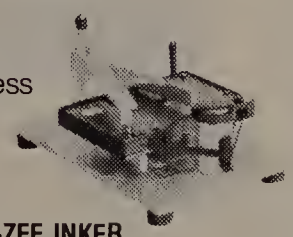

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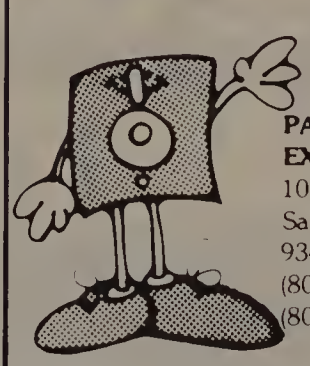

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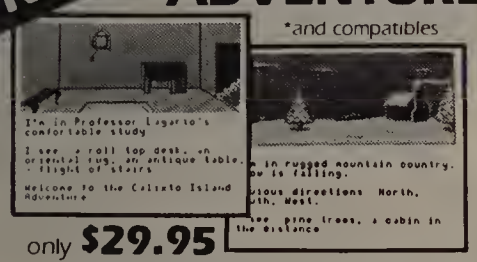

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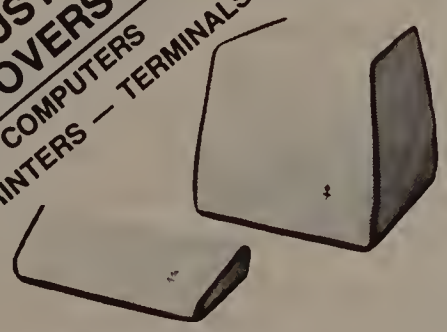

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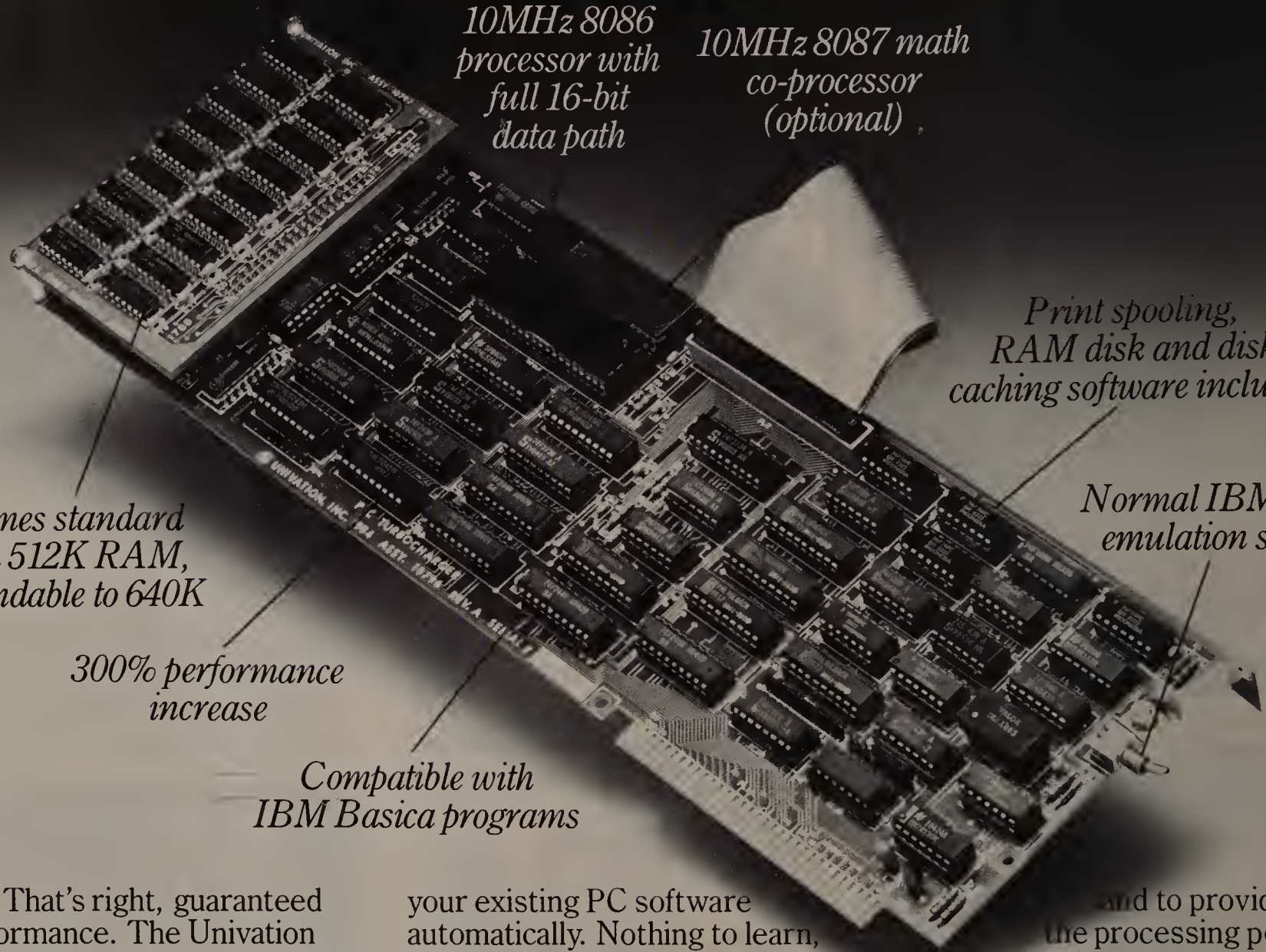

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Star-Dot-Star

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Letters from readers this month include tips for using 1-2-3, Symphony, dBASE III, and WordPerfect, as well as a useful function for BASIC programmers and an exercise for academics.

Edited by Steven Cook

1-2-3 Screen Colors

Lotus's *1-2-3*, version 1A, comes with a screen driver for color monitors, but it does not provide a way to alter the default color selections. If you're tired of those drab cyan borders and pale white worksheet entries, you can change them by using the DEBUG.COM program (supplied on the DOS Supplemental Programs disk) to modify *1-2-3*'s screen driver, TD.DRV.

Check Table 1 to determine the offset address of the worksheet feature you'd like to change. Each feature has a 2-digit default value. The first digit controls the background color, the second its foreground color. Only colors 0 through 7 are allowed for the background.

Select new color values from Table 2 and copy TD.DRV from the *1-2-3* system disk onto a separate disk and put it away for safekeeping. Put the *1-2-3* system disk into drive A: and a disk that contains DEBUG.COM into drive B:. At the A> prompt, type **B:DEBUG TD.DRV** **< Enter >**. DEBUG will load TD.DRV into memory and display a hyphen prompt.

At DEBUG's prompt, type **E** followed by the appropriate offset address, then press **< Enter >**. DEBUG will display the offset address and its current value. Make sure the current value matches the default value shown in Table 1. If it doesn't, you may have an incompatible version of *1-2-3* and shouldn't attempt these changes.

If the current value matches the default value, type the desired color value, then press **< Enter >**. For example, to make the border color and cursor green, type **E 17E** **< Enter >** and then **20** **< Enter >**. You can repeat the E command to change another feature's color. When you are through changing colors, type **W** **< Enter >** at the hyphen prompt to write the modified TD.DRV to disk. At the next hyphen prompt, type **Q** **< Enter >** to return to DOS.

That's it. The next time you run *1-2-3*, it will display the worksheet using the colors you prefer.

Albert Bleakley
Fort Belvoir, Virginia

Editor's note: This information is for use with 1-2-3 *configured for the standard IBM Color/Graphics Adapter, not the Enhanced Graphics Adapter or other nonstandard devices.*

Two More on 1-2-3

Here are a couple of tips that should be helpful to advanced *1-2-3* users. First, when writing macros remember that many users are accustomed to pressing the <Esc> key to back out of a menu. However, when <Esc> is pressed within a macro, *1-2-3* goes to whatever follows the /XM statement, causing the macro to overwrite a cell with the macro menu labels. This can be a serious problem if the cursor was over an important cell. To avoid this situation, leave a blank line between the cell containing the /XM statement and the first menu item.

My second tip involves the use of long addition formulas such as +A1+B5+C8+F9+H17+I15 +P46+Q55+AA15+AB15. Writing these formulas using the @SUM function is much more efficient. For example, the formula @SUM(A1,B5,C8,F9,H17,I15,

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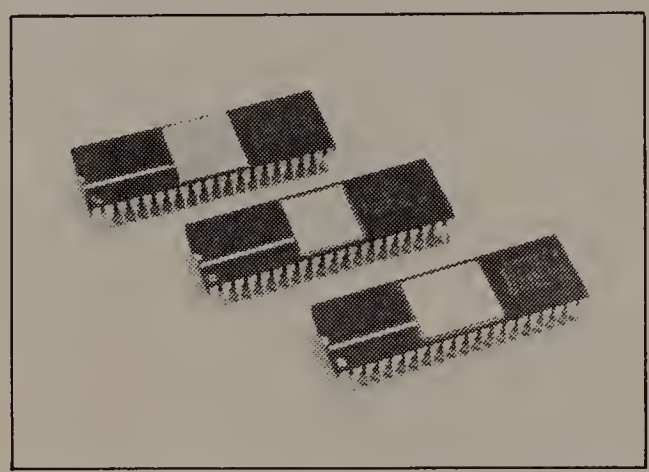

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Table 1: Features set by 1-2-3's color display driver

Features controlled	Offset address	Default value
Worksheet cells, menus, and help screens	17D	07
Border and cursor	17E	30
Unprotected worksheet cells and headings on help screens	17F	0A
Cursor on help screens and cursor on unprotected worksheet cells	180	28

Table 2: Screen color values

0 Black	4 Red	8 Gray	C Light red
1 Blue	5 Magenta	9 Light blue	D Light magenta
2 Green	6 Brown	A Light green	E Yellow
3 Cyan	7 White	B Light cyan	F Bright white

P46,Q55,AA15,AB15) uses less memory as well as less disk space than it does when entered as a string of addition.

Patrick McMahon
Aurora, Colorado

Symphony and 1-2-3 Graphs

If you use both *1-2-3* and *Symphony*, you may not be aware that the PrintGraph functions of the two programs are nearly identical. This means that you can use *Symphony* to display and print graphs created with *1-2-3*. If you keep both programs on a hard disk, you can save disk space by removing *1-2-3*'s GRAPH.EXE program.

Dan Domzalski
Buffalo Grove, Illinois

Editor's note: Of course, you should make an archive copy of the GRAPH.EXE program and store it in a safe place before deleting it.

dBASE III on the Run

I was surprised to discover that the *dBASE III* RUN command can be used to execute programs and DOS commands. For example, the command RUN CD\ will make the root directory the current directory. The command RUN DIR will display the names of the files in the current directory. Even more powerful is the RUN command's ability to execute other

(continues)

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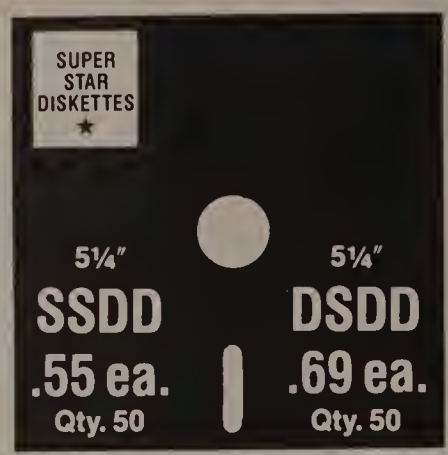

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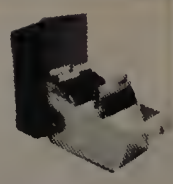

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files, including batch files. Thus, the command RUN ABC will execute the batch file ABC.BAT, which can contain a list of commands to be executed in sequence.

Donald Holmes
New York, New York

Perfect Underlining

If you have a color monitor and use Satellite Software International's *WordPerfect* word processor, you have a limited choice about the way underlined spaces appear when you design forms or similar documents. Using the underline key displays a solid underline on screen but prints a dashed line on some printers. If you press the <F8> key and then type spaces, the program prints a nice solid underline, but you cannot see the line on screen. If you select the first single-color monitor choice of Set Colors for Color Monitor from the Set-up menu, the program displays inverse video spaces after you have pressed the <F8> key, but you lose all color from the display, leaving white text on a black background.

My solution gives me solid underlines both on the printer and on screen. *[Editor's note: Make the following changes on your working copy of* WordPerfect, *not on your archived originals.]* First, run the PRINTER.EXE program provided on *WordPerfect*'s supplementary programs disk and select Printer Definitions (option 3) from the menu. Select your printer from the printer menu, then select the Character Tables option (option A) from the menu that follows.

(continues)

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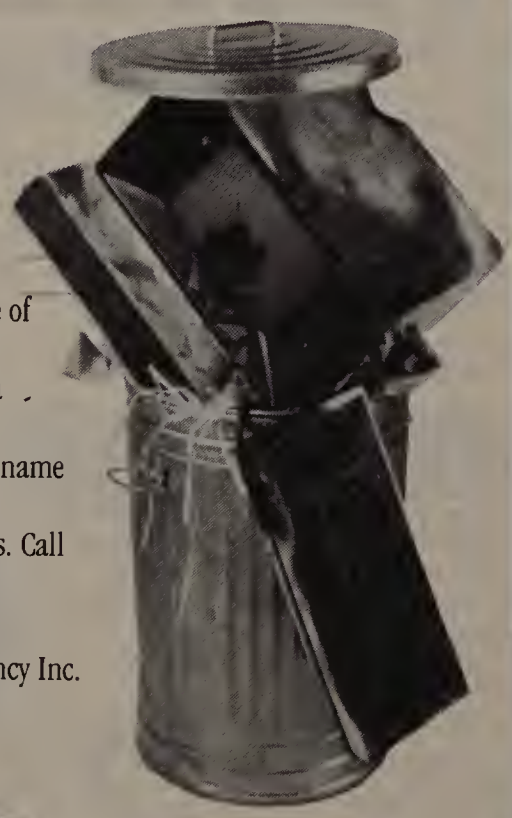

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Circle 441 on reader service card

The program will list the character tables used for your printer's fonts. *[Editor's note: If your printer has more than one character table, you should make the following change to all the character tables of the fonts you use.]* For most printers, one character table will be used for all fonts. Remember that table's name, then select option 9 from the menu. When the list of tables is displayed, select the character table you noted earlier. Use the cursor keys to position the cursor over the underline character (<95>). Select option A from the menu, delete the underline character, press the **< Space >** bar, and then press **< Enter > E < Enter >**. Finally, press **< Enter >** several times to exit the program.

Start *WordPerfect* as usual, then select your revised printer. From now on, whenever you want to create a blank underline in a document, press the <F8> key, then use the underline character as you would on a typewriter. When you finish the line, press <F8> again to turn off underlining. It's as simple as that. In effect, what you are doing is sending space characters to the printer but displaying underlines on screen. That's why you must turn on underlining when you create the line. Otherwise, the printer will only receive spaces.

Mark Kramer
Provo, Utah

(continues)

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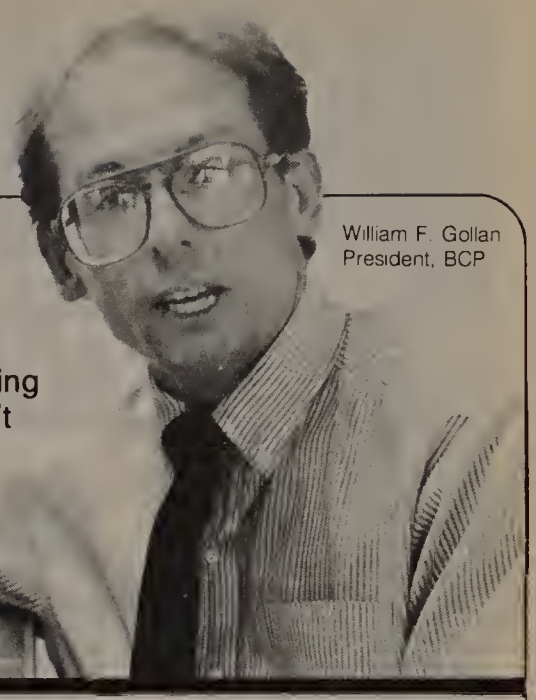

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Introducing Wabash Pinnacle Series Diskettes.

Two years ago, if you'd told me I'd be writing this ad, I would have laughed.

At that time, Wabash diskettes were synonymous with "s—t".

Just saying that quality control was poor would be charitable.

So much was wrong that DISK WDRLD wouldn't sell them.

That was yesterday.

Kearney-National Inc., a $202-million division of a much larger company, came into Wabash.

Out went the old management, the old methods, the old production techniques...and in went a lot of new people, ideas, production lines and some really imaginative thinking.

The end result.

Today, I'm proud to offer you the Wabash Pinnacle Series of diskettes at the prices shown.

This isn't evolution in diskette manufacturing: it's revolution.

Here's what you get.

Wabash Pinnacle diskettes are
...certified 100% Error Free
...are coverd by a LIFETIME WARRANTY
...meet or exceed all industry specifications (by quite some distance)
...and are simply the best value in diskettes available today.

The torture test.

Considering Wabash's earlier dubious reputation, I wasn't exactly a true believer when their Director of Marketing came into my office with samples.

So I took a box at random, selected a disk, bent the thing every which way and slipped it into my IBM-PC.

It formatted. It booted. It stored and retrieved data.

That wasn't enough.

I gave samples of the diskettes to Curt Rostenbach and, in turn, to Tom Streit, both hackers of long experience and members of the Waukegan (Illinois) Apple Users Group.

Tom really went at it.

He took a quartz-halogen lamp, aimed it at the diskette until it started to smoke (and melt)...and then formatted, booted the diskette and stored and retrieved data!

The same terribly (and intentionally) mutilated diskette ran on an ITT, Corona and IBM.

Curt was nicer.

He simply bent the diskette every which way...and it still formatted, booted and ran on his Apple.

The best buy I've ever seen.

DISK WORLD!, Inc. sells more flexible magnetic media by mail-order than anyone else in the world.

I, as President of the corporation, won't tolerate a product with a failure rate of more than 1/1000th of 1 percent.

I also don't like companies who try to milk a "quality" or "premium" image for a higher price like Dysan and Verbatim did...until they failed.

As President of DISK WORLD!, Inc., my motto is simple: "the best diskette for the least amount of money."

Wabash is it.

Right now, there is no better value than the Wabash Pinnacle Series of diskettes.

Granted, you have to buy a hundred at a time, but so what? Split the order with friends, relatives, co-workers or even your worst enemies.

The key thing is to get the most diskette for the money.

And this is it.

(Incidentally, as a corporation, we put our money where our mouth is. Dur first order for Wabash Pinnacle Diskettes was 1.5-million units.)

That's an awful lot of faith and confidence.

But, then again, I have the diskette that Tom Streit literally melted...and kept on running.

The truth about $1.00 or less diskettes.

More and more ads are popping up offering diskettes for $1.00 or less.

By the same token, more and more people who were selling used cars a few months ago are now selling diskettes by mail.

We did a little survey of current ads for diskettes advertised for a dollar or less and did some analysis of the market and here's what we found as it applies to 5.25″ DSDD diskettes "supposedly" selling for a dollar or less.

VENDOR:	ADVERTISED LOW PRICE:	ACTUAL PRICE PER 100:	ACTUAL MFGR.:
Unitech	.89 ea.	.92 ea.	Unspecified.
Datatech	.99 ea.	.99 ea.	Unspecified.
Computer Club	.95 ea.	.98 ea.	Unspecified.
	.99 ea.	1.02 ea.	Unspecified.
Communications & Electronics	.49 ea.	.80 ea.	Unspecified.
Precision Data	.89 ea.	.93 ea.	Unspecified.
Diskette Connec.	.93 ea.	.93 ea.	Unspecified.
Comp Soft Serv.	.77 ea.	.77 ea. + shpg.	Unspecified.
Computer/Computer	.99 ea.	.99 ea.	Unspecified.
DISK WORLD	.89 ea.	.92 ea.	Wabash Datatech

The real truth about $1.00 or less diskettes.

It costs all diskette manufacturers about the same to produce a diskette. Some may charge more because they want to project a "premium quality" image, ala the late, lamented Dysan who bought their basic media from 3M.

Some charge less because they sell a sub-standard product...and we're not foolish enough to name names here.

But here's the truth about the $1.00 or less diskette market.

It falls into four categories:

1. The DISK WORLD's of the universe who simply are so big that they can buy first quality product in massive quantities and choose to pass on the savings to you. (Precision Data and Diskette Connection on **BRAND NAME** products also fall into this category.)

2. The people who buy "cosmos"...stuff from major manufacturers that usually hits quality control standards, but is cosmetically blemished and thus can't be packaged and sold under the manufacturer's own name.

3. "Duplicator Duality". Uncertified media, usually below manufacturer's own standards and frequently below ANSI and IBM standards. Sold on an "as-is" basis with the understanding that the manufacturer's name will never be divulged. Usually about a 20% reject rate...as compared to DISK WDRLD's standard of less than 1/1000th of 1% reject/return rate. Next to garbage, this is the source of most diskettes advertised at a dollar or less.

They may work...and then again they may not. (Frankly, the odds at the Blackjack table in Las Vegas are more in your favor.)

4. Garbage. Stuff that shouldn't be sold at all. But some manufacturers are hurting for cash, so they sell it anyway. (After all, they want to meet their payroll. Look what happens when you don't: you become a Dysan or Verbatim. Lots of history, but no money.) More and more garbage is being dumped into the market as manufacturers become pressed for cash and are motivated into selling anything and everything they can manufacture. (Read the article in FORBES about Verbatim and its "Bonus" brand.)

Finally, the Taiwanese counterfeiters are moving into the act. Perfect duplicates of the packaging of major manufacturers with one exception: the quality isn't there.

The Critical Factor.

Dnly DISK WORLD!, Inc. offers fully brand-identified, LIFETIME-WARRANTY product for less than a dollar.

Every one else offering 5.25″ product for less than a buck doesn't tell you who makes it.

We do.

And that ought to tell you a lot right there.

Ordering & Shipping Instructions

SHIPPING: Wabash Pinnacle Diskettes are sold in multiples of 100 only. Shipping charges are $3.00 per 100, regardless of type or size.

PAYMENT: VISA, MASTERCARD and PREPAID orders accepted. Corporations rated 3A2 or better and government and quasi-government open accounts are accepted on a NET 15 basis.

C.O.D. orders are subject to a $5.00 special handling charge. (Sorry for the increase, but too many people have been refusing C.D.D. orders or using bad checks. It's a classic example of a few "bad eggs" making life more expensive for everyone else.)

APO, FPO, AK, HI & PR ORDERS: Include shipping as shown **and** an additional 5% of the total amount of the order to cover PAL and insurance.

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SOFTWARE GROUP, Enable	695	379
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PFS: Proof	95	64

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PC Saver Line Cord w/Filter	50	39
MOUSE SYSTEMS, PC Mouse & Paint	220	149
MEMORY CHIPS, CABLES, POWER BACKUPS, CLEANING KITS, COVERS, PROTECTORS, FLOPPIES, etc.	CALL	CALL
BOARDS		
AST, Mega Pak (256k)	495	359
AST, Advantage (128k)	595	419

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HERCULES, Graphics	499	309
QUADRAM, Quadboard (256k)	595	359
PARADISE, 5 pack	229	174
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IOMEGA, TALLGRASS, CORVUS, others	CALL	CALL
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HAYES, Smartmodem 1200b	489	364
Smartmodem 1200b (w/Smartcom II)	549	379
Smartmodem 2400	899	639
PROMETHEUS, Promodem 1200b	375	269
Promodem 1200	495	339
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AMDEK, 310a (Amber)	230	159
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New BASIC Functions

When programming in BASIC, I have often needed two functions that aren't available in either BASIC or BASICA: the MIN function, which returns the lesser of two values supplied, and the MAX function, which returns the greater.

For example, if you set variable A to 3 and variable B to 7, executing the statement X = MIN(A,B) sets the value of X to 3. The statement X = MAX(A,B) would set X to 7.

The two lines of BASIC shown in MINMAX.BAS are BASIC statements to create user-defined functions for MIN and MAX. Due to the design of the PC's BASIC, the letters FN must precede the name of each function. Also, the lines must be executed before the functions are used, so it's a good idea to put them near the top of your program.

Greg Perry
Tulsa, Oklahoma

Learning to Paint

The listing PAINT.BAS is a BASIC language routine similar to the paint command provided by Advanced BASIC. Filling a figure with color was a procedure that always amazed me. Recently I learned the logic behind such a routine when I developed a drawing program. (I intend to offer the drawing program, Free Draw, in exchange for contributions.) The

(continues)

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```
10 DEF FNMIN(A,B)=-B*(B<A)-A*(A<B)
20 DEF FNMAX(A,B)=-B*(B>A)-A*(A>B)
```

MINMAX.BAS: User-defined MIN and MAX functions for BASIC

```
2000 'BASIC language graphics paint routine
2010 'Input: X,Y (coordinates of a point within area to paint)
2015 'Output:  To screen only
2018 '
2020 DIM STACK(200)                        ' reserve memory for a stack
2025 MAXX=640:MAXY=200                     ' set maximum limits of screen size
2030 SP=0                                  ' zero the stack pointer
2040 GOSUB 2440                            ' push original x and y onto stack
2050 IF SP=0 THEN RETURN                   ' return when done painting
2060 GOSUB 2500                            ' pop x and y off stack
2070 V=POINT(X,Y)                          ' look at point at that location
2080 IF (V<>0) OR (Y<0) OR (Y>MAXY) GOTO 2050 ' if occupied goto next point
2090 V=POINT(X+1,Y)                        ' look at the point on the right
2100 WHILE (V=0) AND (X<MAXX+1)            ' continue looking
2110    X=X+1                              ' at points on the right
2120    V=POINT(X+1,Y)                     ' until a filled point or boundary
2130 WEND                                  ' is found
2140 Y=Y-1                                 ' now move up one line
2150 V1=POINT(X,Y)                         ' and examine point at that location
2160 IF (X<0) OR (X>MAXX) OR (Y<0) OR (Y>MAXY) THEN V1=1 ' off screen is limit
2170 IF V1=0 THEN GOSUB 2440               ' push this point onto the stack
2180 Y=Y+2                                 ' now move to line below
2190 V2=POINT(X,Y)                         ' and examine point at that location
2200 IF (X<0) OR (X>MAXX) OR (Y<0) OR (Y>MAXY) THEN V2=1 ' off screen is limit
2210 IF V2=0 THEN GOSUB 2440               ' push this point onto stack
2220 Y=Y-1                                 ' move back to current line
2230 X2=X                                  ' save rightmost point to fill
2240 Y2=Y                                  ' and its y coordinate
2250 Y=Y-1                                 ' move back to line above
2260 V=POINT(X,Y)                          ' and look at that point
2270 IF (X<0) OR (X>MAXX) OR (Y<0) OR (Y>MAXY) THEN V=1 ' off screen is limit
2280 IF V=0 THEN IF V1<>0 THEN GOSUB 2440 ' save above point if it's fillable
2290 V1=V                                  ' save status of above point
2300 Y=Y+2                                 ' now move to line below
2310 V=POINT(X,Y)                          ' and examine point at that location
2320 IF (X<0) OR (X>MAXX) OR (Y<0) OR (Y>MAXY) THEN V=1 ' off screen is limit
2330 IF V=0 THEN IF V2<>0 THEN GOSUB 2440 ' save point if it's fillable
2340 V2=V                                  ' save status of this point
2350 Y=Y-1                                 ' move back to current line
2360 X=X-1                                 ' and over one point horizontally
2370 V=POINT(X,Y)                          ' examine point at that location
2380 IF (V=0) AND (X>0) AND (X<=MAXX) AND (Y>0) AND (Y<=MAXY) THEN GOTO 2250
2390 X=X+1                                 ' continue if OK, otherwise move over
2400 X1=X                                  ' and save the point
2410 Y1=Y
2420 LINE (X1,Y1)-(X2,Y2),,BF              ' draw line between saved points
2430 GOTO 2050                             ' loop to get next point on stack
2440 'push x then y onto stack
2450 STACK(SP)=X                           ' put x onto stack
2460 SP=SP+1                               ' increment stack pointer
2470 STACK(SP)=Y                           ' put y onto stack
2480 SP=SP+1                               ' increment stack pointer
2490 RETURN
2500 'pop y then x off the stack
2510 SP=SP-1                               ' decrement stack pointer
2520 Y=STACK(SP)                           ' get y off stack
2530 SP=SP-1                               ' decrement stack pointer
2540 X=STACK(SP)                           ' get x off stack
2550 RETURN
```

PAINT.BAS: Graphics filling algorithm written in BASIC

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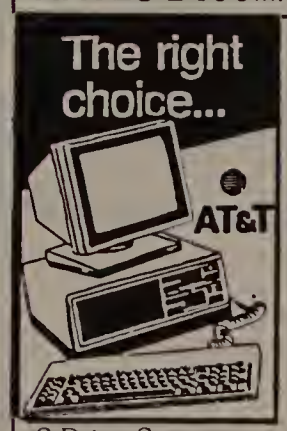

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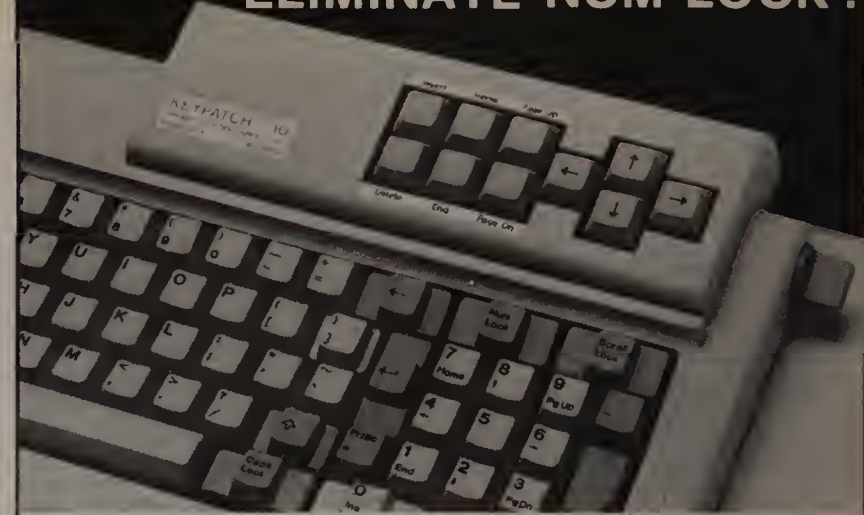

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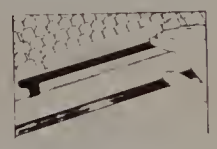

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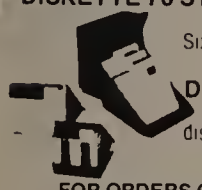

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Ask about ZeroDisk to run copy-protected software from a hard disk without floppies.


```
100 DEFINT A-Z:SCREEN 1:CLS                      ' Initialize, set screen mode
110 FOR I=0 TO 3:READ L(I):NEXT                  ' then draw a shape to fill
120 LINE (L(0),L(1))-(L(2),L(3))                 ' using a point-to-point
130 L(0)=L(2):L(1)=L(3):READ L(2),L(3)           ' description of the shape
140 IF L(2)>0 THEN 120
150 DATA 50,50,100,50,125,75,150,50,200,50
160 DATA 200,75,175,100,200,125,200,150
170 DATA 150,150,125,125,100,150,50,150
180 DATA 50,125,75,100,50,75,50,50,-1,-1
190 '
200 GOSUB 260                                    ' Pause
210 X=125:Y=100                                  ' Set fill point
220 GOSUB 2000                                   ' Call fill routine
230 GOSUB 260                                    ' Pause
240 WIDTH 80:SCREEN 0,0,0:END                    ' End demo
250 '
260 'Pause routine
270 LOCATE 25,1:PRINT "Press any key: ";         ' Display message
280 IF INKEY$="" THEN 280                        ' Wait for keystroke
290 LOCATE 25,1:PRINT "                  ";      ' Erase message
300 RETURN
310 '
```

PAINTDMO.BAS: Demonstration program for use with PAINT.BAS

routine I use in Free Draw is written in assembly language, but I've converted it to BASIC so readers may understand the general technique and convert it to other languages as they desire.

As published here, PAINT.BAS will work in either medium- or high-resolution graphics mode. You may wish to change the program so it will check for a specific boundary color instead of just look for occupied points.

Steven Leventer
Potomac, Maryland

Editor's note: Combine the program PAINTDMO.BAS with PAINT.BAS to demonstrate the PAINT.BAS routine. PAINT.BAS is incredibly slow, but it does serve as a useful tutorial and guide for programmers. Readers interested in Mr. Leventer's Free Draw program may write to him at 10919 Candlelight Ln., Potomac, MD 20854.

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Memory option. 18 - 128 Kilobit (150ns) D-RAM chip set. Adds 256 KB to PC-AT basic model making 512KB PC-AT. With an ATplus drive, you can build the PC-AT IBM should have built in the first place.

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So, do your part for effective money management; hard disk storage is no place to be penny-wise and pound foolish.

TELL 'EM YOU NEED HIGH SPEED AND DATA PROTECTION.

These and other important features do add cost, but that makes a premium drive.

Anything that can be made, can be made cheaper, sell for less, offer lower performance, and probably die young.

Remember, usually you get what you pay for, and you ALWAYS get what you don't.

ALL HARD DISKS ARE NOT CREATED EQUAL.

There are vast differences in the speed and reliability of Winchester hard disks. Since the IBM PC-AT is an incredibly fast machine, a slow drive can make an AT run like an XT.

So, before you get stuck with a slow drive in your AT, save your boss two grand and buy an XT.

Or better yet, buy the AT and avoid any drive with Access Times over 40 milliseconds.

RELIABILITY: WHERE HAS ALL THE DATA GONE?

Now tell 'em the drive must have a data protection scheme. One that's easy to use and reliable.

Winchester heads read and write while "flying" a few microns above the data surface. If the heads contact the recording media, you risk a head crash, and significant or total data loss.

So, even a fast drive without data protection is virtually worthless. Frankly, we'd rather sleep at night.

BEWARE OF USER-DEPENDENT PROTECTION SCHEMES.

Some drives have a safe landing zone for the heads, but you need to call a separate program to send 'em there. If you don't call that program, and most folks won't, the heads in these drives ALWAYS land on data when powered down.

The slightest bump or vibration can move the heads, wiping out those data tracks. And the R/W heads can become contaminated, thus increasing the error rate, slowing down average access until the whole drive fails.

Consequently, those drives offer a very high risk of head crashes, a false sense of security, and little else.

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OUR DRIVES HAVE ALL BEEN TO BOOT CAMP.

Avoid drives that CLAIM PC-AT compatibility but can't BOOT the AT. By the time you juggle the diskettes necessary to use one of those drives, the phrase "user-hostile" will have deep personal significance.

We believe that computers ought to serve people, not the other way around.

BEWARE OF THE BARGAIN BAND-SCHLEPPER.

Avoid drives with inexpensive Band-Stepper positioner technology. These were pretty good way back in 1980, considering that's all anyone had. But by today's standards, they're inaccurate and very mechanical.

They waste time looking for the right track to read or write. And they're worth no where near the price you'll pay for 'em –in more ways than one.

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Speed is dramatically increased since head movement is created electronically, with minimal mechanical interfacing.

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1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72
73	74	75	76	77	78	79	80	81	82	83	84
85	86	87	88	89	90	91	92	93	94	95	96
97	98	99	100	101	102	103	104	105	106	107	108
109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132
133	134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155	156
157	158	159	160	161	162	163	164	165	166	167	168
169	170	171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190	191	192
193	194	195	196	197	198	199	200	201	202	203	204
205	206	207	208	209	210	211	212	213	214	215	216
217	218	219	220	221	222	223	224	225	226	227	228
229	230	231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250	251	252
253	254	255	256	257	258	259	260	261	262	263	264
265	266	267	268	269	270	271	272	273	274	275	276
277	278	279	280	281	282	283	284	285	286	287	288
289	290	291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310	311	312
313	314	315	316	317	318	319	320	321	322	323	324
325	326	327	328	329	330	331	332	333	334	335	336

337	338	339	340	341	342	343	344	345	346	347	348
349	350	351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370	371	372
373	374	375	376	377	378	379	380	381	382	383	384
385	386	387	388	389	390	391	392	393	394	395	396
397	398	399	400	401	402	403	404	405	406	407	408
409	410	411	412	413	414	415	416	417	418	419	420
421	422	423	424	425	426	427	428	429	430	431	432
433	434	435	436	437	438	439	440	441	442	443	444
445	446	447	448	449	450	451	452	453	454	455	456
457	458	459	460	461	462	463	464	465	466	467	468
469	470	471	472	473	474	475	476	477	478	479	480
481	482	483	484	485	486	487	488	489	490	491	492
493	494	495	496	497	498	499	500	501	502	503	504
505	506	507	508	509	510	511	512	513	514	515	516
517	518	519	520	521	522	523	524	525	526	527	528
529	530	531	532	533	534	535	536	537	538	539	540
541	542	543	544	545	546	547	548	549	550	551	552
553	554	555	556	557	558	559	560	561	562	563	564
565	566	567	568	569	570	571	572	573	574	575	576
577	578	579	580	581	582	583	584	585	586	587	588
589	590	591	592	593	594	595	596	597	598	599	600
601	602	603	604	605	606	607	608	609	610	611	612
613	614	615	616	617	618	619	620	621	622	623	624
625	626	627	628	629	630	631	632	633	634	635	636
637	638	639	640	641	642	643	644	645	646	647	648
649	650	651	652	653	654	655	656	657	658	659	660
661	662	663	664	665	666	667	668	669	670	671	672

673	674	675	676	677	678	679	680	681	682	683	684
685	686	687	688	689	690	691	692	693	694	695	696
697	698	699	700	701	702	703	704	705	706	707	708
709	710	711	712	713	714	715	716	717	718	719	720
721	722	723	724	725	726	727	728	729	730	731	732
733	734	735	736	737	738	739	740	741	742	743	744
745	746	747	748	749	750	751	752	753	754	755	756
757	758	759	760	761	762	763	764	765	766	767	768
769	770	771	772	773	774	775	776	777	778	779	780
781	782	783	784	785	786	787	788	789	790	791	792
793	794	795	796	797	798	799	800	801	802	803	804
805	806	807	808	809	810	811	812	813	814	815	816
817	818	819	820	821	822	823	824	825	826	827	828
829	830	831	832	833	834	835	836	837	838	839	840
841	842	843	844	845	846	847	848	849	850	851	852
853	854	855	856	857	858	859	860	861	862	863	864
865	866	867	868	869	870	871	872	873	874	875	876
877	878	879	880	881	882	883	884	885	886	887	888
889	890	891	892	893	894	895	896	897	898	899	900
901	902	903	904	905	906	907	908	909	910	911	912
913	914	915	916	917	918	919	920	921	922	923	924
925	926	927	928	929	930	931	932	933	934	935	936
937	938	939	940	941	942	943	944	945	946	947	948
949	950	951	952	953	954	955	956	957	958	959	960
961	962	963	964	965	966	967	968	969	970	971	972
973	974	975	976	977	978	979	980	981	982	983	984
985	986	987	988	989	990	991	992	993	994	995	996
997	998	999	1000								

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Advertiser Index

Reader Service Number

18 AST Research, 254
19 AST Research, 8-9
476 Adax, 266
944 Advanced Digital Corp., IFC
41 Aha, 308
664 Alfred Publishing Co., 304
315 Alloy Computer Products, 300-301
930 Alpha Omega, 246
6 Alpha Software Corp., 15
779 American High-Tech, 297
7 American Training Int'l., 79
543 American Small Business Computers, 258
961 Apex Resource, 22
10 Apparat, 308
594 Ark Electronic Products, 303
825 Arlington Computer Products, 279
368 Atari Corp., 60-61
28 Autodesk, 74-75
— B. Dalton Bookseller, 159
471 BP-10 Int'l. Corp., 66
317 Barr Systems, 155
202 Best Programs, 330
845 Bible Research Systems, 244
622 Bittner Electronics, 307
507 Blaha Software - Janus Associates, 302
721 Borg Industries, 307
954 Borland Int'l., 41
760 Borland Int'l., 43
178 Brown Disc, 232
865 Bulldog Computer Products, 329
— Business Computers of Peterborough, 321
397 CXI, 73
642 Cableco Int'l. Corp., 280
450 Central Point Software, 106
31 Central Point Software, 244
339 Central Point Software, 80
935 Chorus Data Systems, 156
— Codex Corp., 83
613 Comark, 266
879 Command Technology Corp., 14
765 Companion Software, 265
892 Companion Software, 265
90 Compuclassics, 313

Reader Service Number

— Compumail, 350
856 CompuServe, 42, 241
406 Computer Innovations, 324
951 Computer Inventory Control, 326
420 Computer Mail Order, 351
600 Computer Mart, 325
210 Computer Plus, 102
146 ComputerAid, 309
276 Contemporary Computerwear, 309
646 Control Data, 82
322 Core Int'l., 333
49 Corvus Systems, 277
110 Creative Micro, 314
— Curtis Manufacturing Co., 315
33 Dac Software, 17
488 Davidson & Associates, 259
973 Dayna Communications, 100-101
342 Decision Resources, 46-47
58 Diamond Software, 109
330 Discount Micro Sales, 306
780 Disk World, 316, 322, 331
691 Diskette Connection, 330
288 DiTron Corp., 309
199 Diversified Computer Systems, 328
176 Dow Jones News/ Retrieval, 67
— Eastman Kodak, Co., 203
493 Ecosoft, 276
214 800-Software, 327
— Electronic Software Publishing, 257
527 Elite Software Development, 36
243 Emulex/Persyst, 34-35
699 Everex Systems, 10
— Express Micro Supplies, 334
71 Fox & Geller, 157
854 4·5·6 World, 308
532 Futures Group, The, 308
78 Genest Technologies, 330
996 Gould Electronics, 274
891 H & E Computronics, 27
495 Hammerlab Corp., 242
314 Handic Software, 283
489 HavenTree Software Ltd., 309
815 Hayes Microcomputer Products, 58
77 Hercules, 110, 269
810 Hewlett-Packard, 299
242 Hewlett-Packard, 57, 59
206 Hooleon Co., 302
234 Hypergraphics, 206
684 I.C. Express, 307
294 I² Interface, 37
— IBM, 153
200 IDEAssociates, 30-31
949 Infocom, 94-95
67 Information Builders, 267
512 Inmac, 263
224 Inmac, 263
624 Inner Loop Software, 308
13 Intercontinental Micro Systems, 18
5 Irwin Magnetics, 282
441 JC Information Systems, 320
— Jeden Computer Peripherals, 319

Reader Service Number

627 Juki Office Machine Corp., 68
683 Kamerman Labs, 1
474 Kensington Microware, 45
941 Kimtron, 271
93 Lifetree Software, 298
733 Lionheart, 307
— Lock-Lite, 293
995 Logicsoft, 260-262
— Lotus Development Corp., 84-85
942 Lyben Computer Systems, 330
— Magnacom, 291
117 Mannesmann Tally, 50-51
989 Mark Data Products, 309
98 Maynard Electronics, 5
— McGraw-Hill, 81
657 Meca, 33
— Megasoft, 328
639 Merritt Computer Products, 307
233 Micro Data Base Systems, 240
761 Micro Design Int'l, 154
223 Micro Direct Int'l. Corp., 248
573 Micro Focus, 108
791 Micro Manufacturing Systems, 250
102 Micro Marketing, 239
112 Micro Mart, 352-353
— Microrim, 24-25
40 Micrografx, 28
939 Micromission, 268
103 Microprocessors Unlimited, 328
— Microsoft Corp., 6-7
275 Microstuf, 48
118 Microway, 312
835 Micro-Z Co., 72
120 Mountain Computer, 236-237
124 Nec Information Systems, 252
381 Northeastern Software, 292
88 Norton Utilities, The, 247
533 Office Solutions, 207
273 Okidata, 249
950 Opt-Tech Data Processing, 308
894 Opt-Tech Data Processing, 309
133 Orchid Technology, 202
136 PC Connection, 112-115
460 PC Network, 294-295
293 PC Software Interest Group, 276
629 PC Source, 204-205
576 Pacific Exchanges, 309
555 Pacific Micro Systems, 243
694 Panasonic Industrial Co., 107
— Paperback Software, 286
286 Peachtree Software, 270
142 Persoft, 23
575 Photon Software, 56
359 Polaris Software, 272
230 Popular Programs, 317
426 Precision Data Products, 318
574 PreCursor, 63
494 Prentice-Hall, 245
148 Primavera Systems, 290
931 Princeton Graphic Systems, 19-21
145 Professional Software, 52

Reader Service Number

68 Progressive Micro Distributors, 348-349
511 Public Domain Software, 307
983 QIC Research, 275
— Quaid Software Ltd., 296, 332
907 Qubie', 70-71
328 Rainbow Technologies, 308
643 Random House, 44
65 Rapidware, 323
585 Relational Database Systems, 65
469 Rix Softworks, 308
297 Rolodex Corp., 256
162 RoseSoft, 93
431 SBT Corp., 104
844 SPSS, 273
165 SSI Software, 233
609 Safeware, 318
80 Sakata U.S.A. Corp., IBC
506 Sam Wilson & Associates, 309
— Scitor Corp., 62
886 Secure-It, 238
225 Sigma Designs, 39
— Simon & Schuster, 305
850 Soft/Plus Research, 307
587 SoftStyle, 102
250 SofTron, 309
792 Softronics, 308
862 Software Bottling Co., 77
57 Software Dimensions, 22
526 Software Link, The, 289
579 Sony Information Products, 54-55
456 Spies Laboratories, 272
308 SubLogic Corp., 16
— Summagraphics Corp., 103, 105
890 Summit Software Technology, 32
— Symantec Corp., 238, 239
— Sysgen, 231
51 Tall Tree Systems, 264
188 Tallgrass Technologies, 12-13
190 Tecmar, 49
262 Telebyte Technology, 251
921 Telemart/Telasoft, 354
839 Telescan, 158
701 Televideo Systems, 76
— Texas Instruments, 64
671 Thomson Consumer Products Corp., 78
213 Timeworks, 38
405 USRobotics, 26
599 Unitech, 307
640 Univation, 310
— VLM Computer Electronics, 307
462 Variant Technologies, 106
61 Variant Technologies, 106
193 Ven-Tel, BC
135 Walonick Associates, 263
45 Watcom Products, 97
69 Writing Consultants, 40
438 Wyse Technology, 284-285
764 XOR Corp., 98
540 Zedcor, 253

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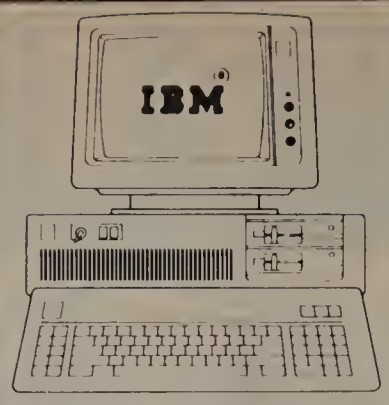

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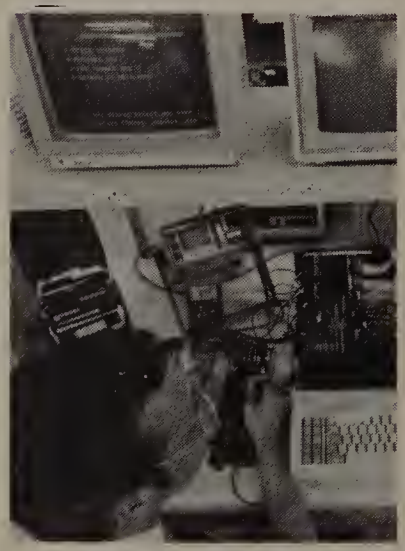

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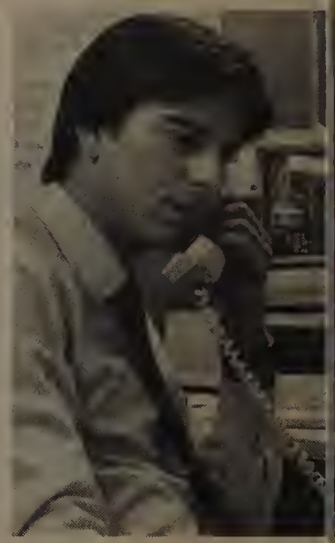

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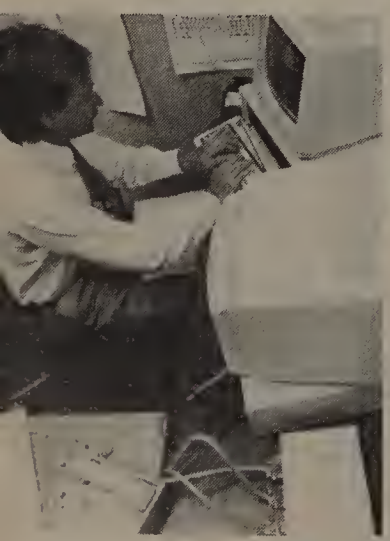

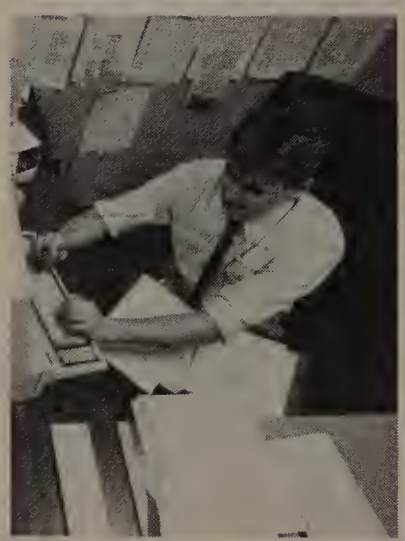

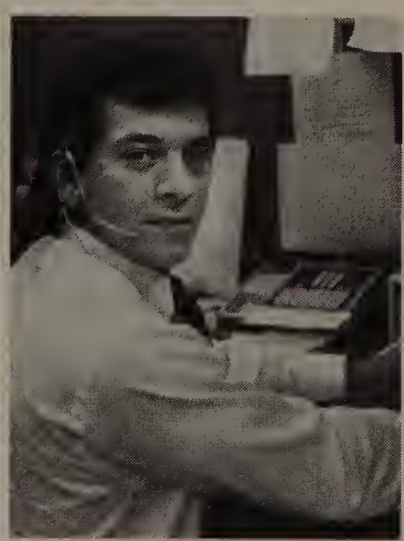

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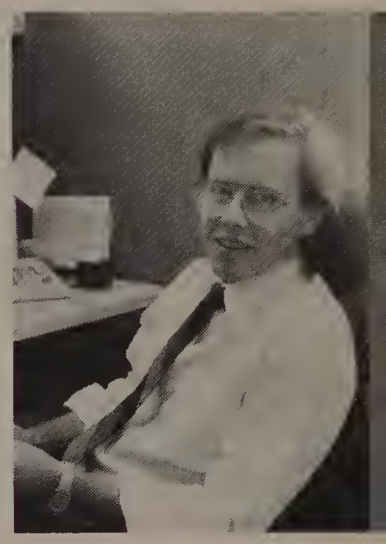

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Hercules Graphics Card	289
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Quadlink	325
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Zenith	Call

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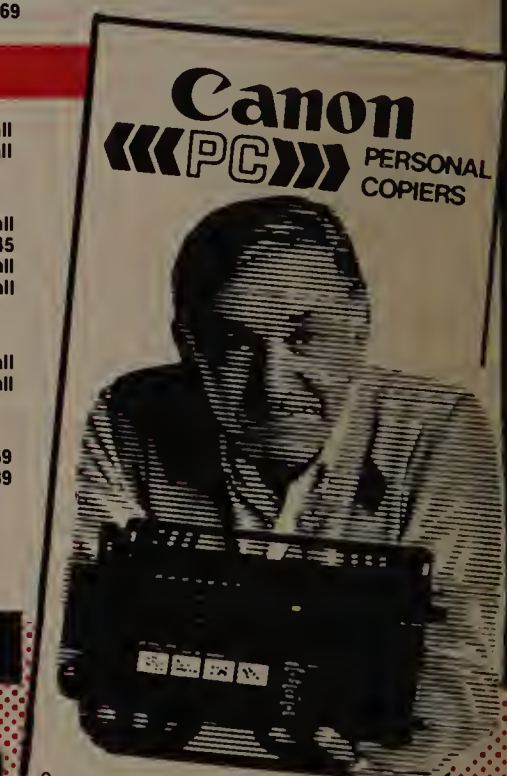

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Canon PC-15	Call
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Ven-Tel's Half Card™ modem is in all the best computers. Here's why...

Ven-Tel gives you lots of reasons to buy our Half Card™ modem for your IBM PC or compatible. The Half Card™ is a complete system that lets you communicate with other PCs, mainframes, and databases effortlessly. It includes Crosstalk-XVI® software. It's reliable. It's got all of the features you want. And it's a good value.

Do You Own One of These Computers?

Chances are you do. And if you're thinking of buying a modem, consider the Half Card™. Because of its small size, the Half Card™ fits in more computers, including all of the models we've listed here. The Half Card™ is small, so it fits in short slots or long. That means you can save your long slots for other expansion uses.

Effortless Communication

Each Half Card™ comes with Crosstalk-XVI® communications software, by Microstuf. It's the easiest to use, whether you're a beginner or an old hand, and the most powerful. A full on-line help menu makes using Crosstalk® for the first time a snap. It can turn your PC into a terminal on a mainframe computer with its powerful terminal emulation feature. It will even operate your PC when you're not there. You can call into an information service such as The Source or Dow Jones News Retrieval, or transfer files and electronic mail, all at the touch of a button. The Half Card™ connects your computer to the world. Effortlessly.

More Modem for Your Money

When you buy the Half Card,™ you don't need anything else. The Half Card™ is a complete communications package that includes a full-featured modem and the best known software on the market. Complete easy-to-understand instructions with full technical support on installation and use. And a very competitive price. The Half Card,™ with Crosstalk-XVI® software, retails for only $549.

Reliability

Ven-Tel has been making modems for 10 years. Our experience shows. Ven-Tel's Half Card™ only has about 70 parts, compared to almost 300 on other modems. We reduced the parts by building the first LSI modem chip using advanced switched capacitor technology. What that means to you is greater reliability and lower power consumption, so you can load up your PC with expansion boards and not worry about heat or power problems. And we back the Half Card™ with a full two-year warranty on parts and labor.

Features

- 1200/300 baud auto-dial, auto-answer.
- Uses the industry standard "AT" command set.
- Runs with virtually all communications software, including Smartcom II and PC Talk III and integrated packages such as Symphony and Framework.
- Includes Crosstalk-XVI® software.
- On-board speaker and extra phone jack for easy switching from voice to data mode.
- Selective tone or pulse dialing; full or half duplex.
- Automatic answer on any ring.
- True ring or busy signal detection.

You Can Buy the Half Card™ Anywhere

You can get the Half Card™ at ComputerLand, Businessland, the Genra Group, Entré Computer Centers, Macy's Computer Stores and other fine dealers nationwide. Also from Ven-Tel: the 1200 Plus,™ an external modem and the PC Modem 1200,™ an IBM internal with V.22 international capability.

Effortless Communication

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Circle 193 on reader service card